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of Engineers®



ANNUAL REPORT ACTIVITIES OF THE INSTITUTE FOR WATER RESOURCES FISCAL YEAR 2008





IWR Headquarters - National Capital Region Office

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INSTITUTE FOR WATER RESOURCES OFFICE LOCATIONS and MISSION SPECIALTIES



➤ **H&H Methods & Models**

- Surface Hydrology
- Hydrologic Statistics
- River Hydraulics
- Watershed Assessment & Ecosystem Function Models
- River Forecasting
- Reservoir Systems
- Water Management

➤ **Waterborne Commerce Statistics**

- Foreign Trade
- Domestic Commerce
- Navigation Infrastructure
- Dredging & Lock Performance
- CW Business Information

➤ **Program Direction**

- Emerging Issues
- Water Resource Trends
- Policy Development
- Program Analysis
- National Studies

➤ **Planning Models & Methods**

- Multi-Objective/IWRM
- Plan Formulation
- Socio-Economic Analysis
- Risk Analysis
- Environmental Evaluation

➤ **Partnering**

- Collaborative Planning
- Public Involvement
- National Interface
- International Outreach

INSTITUTE FOR WATER RESOURCES

BACKGROUND

The U.S. Army Engineer Institute for Water Resources (IWR) is a field operating activity under the staff supervision of 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 specifically recognized as a national expertise center for planning methods, risk analysis, hydrologic engineering, citizen participation and conflict resolution, international water resources, global climate change science, and the collection, management and dissemination of Civil Works and navigation 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 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 essential improvements in planning to be 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 the USACE with the capability for developing forward-looking analysis and state-of-the-art methodologies. IWR fulfills this mission by supporting the Civil Works Directorate and USACE Major Subordinate Commands (MSCs) and District offices by providing: (a) analysis of emerging water resources trends and issues; (b) state-of-the-art planning and hydrologic engineering methods, models and training, and (c) national data management of results-oriented program and project information across Civil Works business lines.

IWR CENTERS

IWR has offices at three locations, each of which is a USACE designated center of expertise (DX): the National Capital Region (NCR) and Navigation Data Center (NDC) offices in the Casey Building at the Humphreys Engineer Center, Alexandria, Virginia; the Hydrologic Engineering Center (HEC) in Davis, California; and the Waterborne Commerce Statistics Center (WCSC) in New Orleans, Louisiana. WCSC is part of the Navigation Data Center (NDC).

In 2008, IWR was in the process of establishing a fourth office at a location to be determined – the Risk Management Center (RMC), which will provide USACE with a critical mass of specialized engineering expertise in dam and levee safety.

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, public participation and conflict resolution, 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 lead Civil Works strategic planning and technology transfer initiatives; conduct national and focused policy development studies; develop a broad range of partnering and investment decision-support techniques, methods and models for integrated water resources management (IWRM) and navigation system applications; interact with national and international members of the water resources community at-large and partner with the HQUSACE, Corps field 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 position, which 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). USACE IWR, through ICIWaRM, was nominated by the U.S. Government to be a UNESCO Category II Water Centre, working in collaboration with key university, federal agency and non-governmental partners sharing an interest in the advancement of the science and practice of integrated water resources management. In 2008, ICIWaRM's nomination as an international water center was endorsed by the governing body of UNESCO's International Hydrological Programme (IHP).

IWR's new Conflict Resolution and Public Participation Center (CPC) focuses both on the processes associated with conflict resolution and the integration of public participation techniques with decision support and technical modeling (Computer Assisted Dispute Resolution - CADRe). The Institute has pioneered the development and advancement of one such CADRe approach known as *Shared Vision Planning* (SVP), and in 2008 IWR was actively involved in supporting USACE districts, the International Joint Commission (IJC), and a range of State and local governments, on the application of SVP as a means to address water resources problems across the nation. Additional information about IWR is available on its web site at www.iwr.usace.army.mil.

Hydrologic Engineering Center (HEC): The primary goal of HEC from its inception in 1965 has been to support the Nation in its water resources management responsibilities by increasing the Corps technical capability in hydrologic engineering and water resources planning and management. An additional goal is to provide leadership for improving the state of the art in hydrologic engineering and analytical methods for water resources planning. Program efforts in research, training, planning analysis and technical assistance raise awareness of the problems and needs of the Corps and the Nation. HEC is committed to keeping abreast of the latest developments throughout the water resources engineering profession and to make use of this information in a manner best suited to the needs of the USACE nationally and internationally. HEC increases the effectiveness of the Corps and the profession by bridging the gap between the academic community, practicing hydrologic engineers and planning professionals. HEC ground-tests and incorporates state-of-the-art procedures and techniques into manuals and comprehensive computer programs. The procedures are made available to the USACE, United States government and international professionals through an effective technology transfer system of technical assistance, publications, DVD's and training. Technical specialty areas addressed by HEC include: precipitation runoff processes, reservoir regulation, reservoir systems analysis, hydrologic statistics and risk analysis, river hydraulics and sediment transport, 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 HEC and its software is available on its web site at www.hec.usace.army.mil.

Navigation Data Center (NDC): NDC is the Corps designated center of expertise for the management of infrastructure utilization and performance information for U.S. waterways and port and harbor channels. Because of the integrated nature of water resources, NDC also directly supports a range of related Civil Works business areas, including hydropower, recreation, environmental compliance, environmental stewardship, water supply, regulatory and homeland security, as well as other Federal, state and local agencies and the private sector. The primary operational arm of 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 measurements and performance-based budgeting processes. Additional information about NDC is available on its web site at www.ndc.iwr.usace.army.mil.

FY 2008 SUMMARY

Post-WRDA 2007 Context: The Institute's FY 2008 program continued to affirm IWR's status as a key USACE institutional asset, serving as the intellectual foundation to the future direction of the Corps Civil Works program, the overarching USACE missions, and the Nation's water resources. Many of the technical and policy development challenges faced in FY 2008 represented an extension of the ambitious program that emerged in the aftermath of the hurricane devastation wrought along the U.S. Gulf Coast in 2005, and the subsequent program and policies reforms ushered in through the enactment of the Water Resources Development Act (WRDA) of 2007 (P.L. 110-114).

The robust mix of planning, policy, engineering and research initiatives that IWR initiated and continued during FY's 2006-2008 was based on the anticipation of a renewed national emphasis on water resources systems (i.e., regional and watershed level planning), accompanied by a Federalism shift from the "project-partnering" paradigm applied to water resources during the late 20th Century, to a new, more collaborative relationship between Federal and State governments in solving water resources at the regional scale. This contemporary planning focus on IWRM and global change provided the overarching context for what proved to be the most challenging, productive and rewarding year in the Institute's 39-year history.

After years of preparatory planning, organizational enhancement, and strategic refinement of IWR's capabilities and focus, FY 2008 represented the culmination of the Institute's substantive technical contributions during an especially crucial timeframe for the USACE and the Nation given the need to transform Federal water resources programs to emphasize 21st Century perspectives, policies and approaches. The enactment of WRDA 2007 served to promulgate program and policy changes based on the results from a wide range of post-hurricane inquiries, investigations and analyses that focused on the circumstances around the 2005 hurricane induced disasters along the U.S. Gulf coast, while also addressing several broader issues of policy interest: (1) the application of integrated water resources management (IWRM); (2) producing outcomes that reflect sustainable solutions, i.e., balancing society's goals for economic development with those for healthy aquatic ecosystems and public safety; (3) a renewed commitment to resilient infrastructure and communities; (4) the embrace of risk-informed communications and decision-making; and (5) enhanced collaboration between Federal, State, local and non-governmental stakeholders.

The U.S. and its principal agencies and science academies (in partnership with other government agencies, non-government organizations, professional societies, universities, and international organizations) undertook a number of comprehensive post-flood audits aimed at identifying lessons learned to inform future decisions on how to harden the hurricane protection system and strengthen flood preparedness and response processes. Aspects of the review encompassed the design and safety standards used for infrastructure, governance and institutional considerations, along with examining the analytical principles and policies used for determining project scope, formulation and justification. The Institute actively participated in this unprecedented array of ex-post initiatives, which involved technical experts drawn from across IWR and the entire USACE.

Key Post-WRDA 2007 Activities: In particular, the enactment of a number of WRDA provisions directly impacted IWR FY 2008 activities, illustrated by the following examples:

- The revised cost-sharing provisions for **watershed studies** (WRDA 2007, Sec. 2010) served to further the alignment of the Civil Works program with IWRM and elevate the importance of the Institute's FY 2008 work on the enterprise GIS-based watershed investment decision tool, the Hydrologic Engineering Center's research to advance the Watershed Assessment Tool (HEC-WAT), and policy and programmatic initiatives for assisting USACE districts in applying regional sediment management approaches (also relevant to WRDA 2007 Sec 2037);

- The technological advancement of electronically accessible, mission relevant performance data (WRDA 2007, Sec. 2017) reinforced the IWR-NDC information program (OMBIL - *Operations & Maintenance Business Information Link*) and OMBIL's Regulatory Module (ORM2.0) which was fully deployed to USACE districts;
- The emphasis on **international water resources** (WRDA 2007, Sec. 2030) affirmed the growing importance of U.S goals for international water security and sustainability, and aligned with IWR's status as the U.S. nominated global center for IWRM in partnership with UNESCO's International Hydrological Programme (IHP). In 2008 IWR also forward deployed an international water resources expert as the U.S. Government (USG) liaison to the Secretariat of the 5th World Water Forum in Istanbul, Turkey, in anticipation of the Forum event in March 2009;
- The revision and update of the **Water Resources Principles and Guidelines (P&G)** (WRDA 2007, Sec. 2031) manifested IWR's active support to the HQUSACE and Office of the Assistant Secretary of the Army (Civil Works) [OASA(CW)] in scoping proposed P&G revisions, assisting in the conduct of the June 2008 public meeting to solicit comments on the existing P&G; participating in the development process for the revised P&G put forward by the ASA(CW) in September 2008, and the review and analysis of the public comments received in response to the published draft;
- In anticipation of the upcoming revision to the P&G, IWR initiated several planning methodology initiatives aimed at seamlessly providing USACE field practitioners with new planning reference tools that are aligned with the contemporary water resources principles. These include an *Economic Primer* (IWR Report IWR 09-R-3), the update of *National Economic Development Manuals for Coastal Storm Damage Reduction and Deep Draft Navigation*, an *Overview NED Manual* (IWR Report IWR-09-R-2), handbooks on the consideration and treatment of *Other Social Effects* and *Regional Economic Development*, a *Multi-objective Planning Manual*, and a *Multi-Criteria Decision Analysis* software module within the IWR Planning Suite Model.
- The provisions of WRDA 2007 (Sec. 2034) for **Independent Peer Review** resulted in IWR support to HQUSACE in scoping new review procedures and requirements, and the initiation of a new contracting vehicle for procuring services that facilitate a robust capability for accomplishing independent peer reviews on a national level; and,
- The enactment of the **Levee Safety Program** (WRDA 2007, Title IX), formalized and elevated the role of USACE in national levee safety and was a motivating factor in HQUSACE approval for IWR establishing its Risk Management Center (RMC) to provide nationally consistent safety assessment tools, approaches and outcomes for dams, levees, and other engineered structures.

In addition, the Institute concurrently continued the following post-Hurricane activities in 2008:

- IWR's leadership of the **Hurricane Protection Decision Chronology (HPDC)** to assemble and publicly document the 50-year chronological record of planning, economic, policy, legislative, institutional and financial decisions that shaped the hurricane protection system for greater New Orleans culminated in the publication of the final HPDC report on the IWR website in June 2008; and,
- IWR's national experts continued to serve on the Corps major organizational response team for infusing technological and institutional reforms based on the lessons learned from Hurricane Katrina—the **Actions for Change (AFC)** initiative. The USACE IWR Chief Economist led the Risk Informed Decision Making team, while IWR specialists actively participated in the Risk Communication and Comprehensive Systems teams, including the leadership of the Temporal and Spatial System (Global

Climate Change) team; development of the Watershed Investment Decision Tool; and the Multi-Objective System Planning and Policy team.

Overall, in FY 2008 IWR executed a record program of approximately \$52 million with 162 authorized in-house employees, primarily in professional scientific-engineering disciplines, with most possessing advanced degrees. The Institute's in-house staff was supplemented by other experts detailed from USACE field offices and laboratories, and Intergovernmental Personnel Act (IPA) visiting scholars from universities, state and local governments, policy think-tanks, and through contracting with the private sector. A major transforming factor during 2008 was the Institute's corporate focus on recruitment, with over 35 new hires (almost 25% of the in-house workforce) made across IWR, including the active use of Federal programs such as hiring the Corps first Presidential Management Fellow (PMF), and an increasing use of the National Academy of Sciences' Research Assistantship Program (RAP) to bring on recent post-Doctoral graduates as water resources specialists.

In FY 2008, Dr. Yacov Haimos of the University of Virginia continued his appointment at the Institute as the Maass - White Scholar. Dr. Gerald Galloway, Maass-White Scholar at IWR during the period of 2006-2007, continued his association with IWR throughout FY 2008 working on several key initiatives associated with the Institute's leadership of the National Flood Risk Management Program, including the interagency coordination on a joint-USACE-FEMA led effort to update Executive Order 11988 on Flood Plain Management.

Nobel Prize Recognition: FY 2008 also represented a milestone for the recognition of the contributions of climate change scientists around the world, with the Norwegian Nobel Committee awarding the Peace Prize to former Vice-President Al Gore and the *Intergovernmental Panel on Climate Change* (IPCC). IWR's Dr. Eugene Z. Stakhiv, who has been an active contributor to the IPCC from its inception, was honored by the IPCC in December 2007 and shared in the recognition for the Nobel Peace Prize. Dr. Stakhiv co-chaired the first IPCC Water Resources Group, served as lead author in the second and third IPCC reports, and actively participated as a reviewer for the fourth IPCC report.

The summary of the Institute's other major 2008 initiatives are presented within the context of the key themes which framed these activities – integrated water resources management, collaborative planning and partnerships, technological advancements, and international activities:

Integrated Water Resources Management: While the Institute's Future Directions Program and Civil Works Strategic Planning activities continued to foster a corporate recognition of the need for systems approaches to solving water resources problems, IWR specialists played central roles in advancing the practice of IWRM through the successful completion of the *Lake Ontario and St. Lawrence River Study* for the International Joint Commission (IJC), and the acceleration of the follow-on IJC study for the *International Upper Great Lakes* (IUGLS) which is investigating the extent to which Lake Superior outflow water management affects the on-going changes in lake levels for Superior and Lakes Michigan, Huron, and Erie and their connecting channels, particularly the St. Clair River. The demonstrated value of practicing IWRM was also furthered by the involvement of IWR specialists in the Corps *Western States Watershed Study*, and the embrace of the study findings by the Western States Water Council (WSWC) and the Western Governors Association (WGA), as reflected in the publication of the USACE *Western States Watershed Study Final Report*, and the WSWC's own report *Water Needs and Policies for a Sustainable Future: Next Steps* (June 2008). Among the key outcomes of this initiative was the establishment of WestFAST – the *Western States Federal Agency Support Team*, with a Federal liaison position, representing all of the Federal water-related agencies, and deployed at the WSWC offices in Salt Lake City. The IWR Director participated in the interagency search and served on the selection panel for the position, which was filled by a candidate from the U.S. Bureau of Reclamation.

IWR specialists led the adaptation to climate change assessment portion of the Western States Watershed Study, and continued to actively participate in and lead several follow-on climate change initiatives through active participation in the *Climate Change and Western Water Group* (C-CAWWG). An IWR senior scientist also served as the co-lead, in collaboration with the USACE Engineer Research and Development Center (ERDC), for the Gulf of Mexico Regional Sediment Management (RSM) demonstration program, and other Corps RSM activities, and IWR and HEC specialists continued to provide technical assistance on several pilot project partnerships with The Nature Conservancy on their Sustainable Rivers Program.

At the same time, IWR researchers worked to continue advancing IWRM planning, economic and hydrologic and hydraulic engineering tools, resulting in the 2008 issue of the new *IWR-Planning Suite* software, and the release of new editions of the full range of HEC's flagship NexGen software products, along with the rollout and immediate field application of state-of-the-art systems models for maritime transportation economics as part of the Institute's *Navigation Economic Technologies (NETS) Research Program*. Another significant technology milestone was the completion of the deployment and training phases for the *OMBIL Regulatory Program Module* (ORM 2.0), a web-based, enterprise GIS data management system now used by all USACE field offices, which provides the anchor technology for watershed-based analytics and decision-support for the Corps regulatory program, and is expected to play a foundational role for the entire Civil Works program.

A key IWRM-related activity was the nomination (in February 2008) of USACE IWR's [*International Center for Integrated Water Resources Management*](#) (ICIWaRM) by the ASA(CW) and the U.S. State Department as a global water center as part of the UNESCO's International Hydrological Programme (IHP). The USG nomination served to affirm USACE IWR's status among the world's premier expertise centers for IWRM, and ICIWaRM will also be the first U.S.-based UNESCO water center, and the first such center in North America.

Collaborative Planning and Partnerships: Through the Institute's role in supporting the USACE-wide implementation of the Civil Works Strategic Plan (2004-2009) and the ongoing development of the next Strategic Plan (2010-2014) in accordance with the *Government Performance and Results Act* (GPRA), IWR continued to promote, support and engage in intergovernmental collaborations and partnering throughout USACE, and with a wide range of national and international institutions and organizations as a means of accomplishing common goals. IWR continues to serve as the USACE lead for multiple national partnerships and is committed to developing new technologies, processes and policies to further collaborative planning and partnering.

IWR's partnering focus on national water resources issues in 2008 included representing both USACE and the Office of the Secretary of Defense (OSD) on the Executive Office of the President's National Science and Technology Council Interagency Subcommittee on Water Availability and Quality (SWAQ). IWR actively participated in the development of the SWAQ Strategic Plan for Federal water resources agencies to ensure adequate water availability and quality, culminating in the publication of the report [*A Strategy for Federal Science and Technology to Support Water Availability and Quality in the United States*](#), September 2007. IWR is likewise supporting USACE participation in the implementation of the President's Ocean Action Plan through integrated networks and partnerships of Federal, state, local, territorial and tribal authorities, the private sector, international partners and ocean communities.

In the advancement of collaborative planning models and guidance, IWR's *National Cooperative Modeling and Collaborative Planning and Management Demonstration Programs* worked in synergy to test and demonstrate a variety of collaborative modeling tools and concepts. Given the Institute's long history of applying collaborative modeling tools through its signature *Shared Vision Planning* (SVP) process, IWR was positioned to advance and apply contemporary conceptual and methodological approaches, as well as documenting, vetting and publicizing the advances and experiences of other institutions.

This led to HQUSACE designating IWR's [Conflict Resolution and Public Participation Center](#) (CPC) as a USACE national expertise center (DX) in 2008. IWR-CPC established an extended partnership via a new [Memorandum of Understanding](#) (MOU) with the *U.S. Institute for Environmental Conflict Resolution* (USIECR), located within the Udall Center at The University of Arizona. The combined resources of USACE IWR and USIECR provide a robust capability for assisting USACE field offices and other government agencies in the resolution of environmental, natural resources and public land conflicts and controversies through facilitated negotiation, mediation, and collaborative problem-solving, including the use of collaborative computer modeling to help solve disputes over water.

IWR also published a collaborative planning handbook for use by USACE field practitioners. The report entitled, "*Project Planning in Collaboration with Government Entities – Practical Approaches*" (IWR publication 07-R-02) provides an introduction to the concept of collaboration as it applies to problem solving with Federal, state, and local governmental agencies.

The Institute executed a wide range of technical assistance projects, such as the Hydrologic Engineering Center's support of system-wide reservoir operations for the Lower Colorado River Authority (LCRA). IWR continued building international water partnerships with the appointment of IWR senior staff to the Governing Board of the United Nations Educational, Scientific and Cultural Organization (UNESCO) *Institute for Water Education* (IHE-Delft), and the Advisory Board of the *International Center for Water Hazard and Risk Management* (UNESCO-ICHARM).

New Memoranda of Understanding (MOU's) were executed in FY 2008 with a number of universities and professional organizations, with these partnerships facilitating cooperation in technology, science and research in aspects of integrated water resource management and capacity building in developing nations and countries in transition. Each of the universities with which IWR has entered into MOUs has unique program features that compliment the strengths and talent of the Institute. These include the aforementioned *U.S. Institute for Environmental Conflict Resolution* (USIECR) within the Udall Center of The University of Arizona, and new partnerships with [Colorado State University](#), International School for Water Resources/Civil and Environmental Engineering Department; Sandia National Laboratory (SNL); the [American Water Resources Association](#) (AWRA); and the [Global Water Partnership](#) (GWP).

In FY 2008 the *Silver Jackets Program*, a key partnering mechanism with the Federal Emergency Management Agency (FEMA) and other Federal, State and local agencies to ensure continuous interagency pre-disaster collaboration at the state level, expanded the number of operational regional teams into six states, with the ultimate goal of offering at least one interagency team within every state. Efforts are planned to initiate or supplement existing teams in the states of Idaho, Kansas, Hawaii, Texas, Louisiana, New Mexico, Kentucky, Illinois and Missouri, with at least one team anticipated in both of the Corps North Atlantic and South Atlantic Divisions.

USACE also established the *Regional Interagency Levee Task Force* (ILTF) in 2008 in response to the catastrophic floods in the upper Midwest earlier that year. The ILTF enabled a joint Federal-state partnership to address expedited repair of damaged levee systems in the upper Midwest and identify non-structural mitigation measures that could be implemented during recovery to reduce future flood risks. The ILTF included regional representatives from the USACE, FEMA, USEPA, the Economic Development Administration, US Fish and Wildlife Service, NRCS, USGS, the Small Business Administration, Department of Housing and Urban Development, and representatives from the States of Iowa, Illinois, Wisconsin, Missouri and Indiana.

Technological Advancements: IWR continued to provide technical assistance on *Risk Analysis* to the New Orleans District and Mississippi Valley Division on the congressionally authorized Louisiana Coastal Protection and Restoration (LACPR) study. IWR senior staff specified a scenario-based, risk-informed

planning approach to be integrated within the Corps traditional six-step planning process, and led workshops with LACPR staff to enhance understanding and advance the implementation of the planning framework for coastal Louisiana. This served a complementary purpose of developing a nationally consistent *risk-informed planning framework* to support implementation of the risk-based concepts in planning, design, construction, operations, and major maintenance action of Actions for Change. IWR involvement was concentrated on implementation, using the LACPR study as a test-bed demonstration.

Adaptation to Climate Change: IWR accelerated its work in FY 2008 on the development of a policy and management framework for addressing USACE adaptation to global change across the Civil Works program, including climate change and other changes due to demographics, land use, emerging regional water scarcity, increased competition for water use, and evolving societal values. Key initiatives include:

- An interagency group was formed to develop consistent water management adaptation policies and approaches to address global change across Federal water agencies, and to jointly consider what actions Federal agencies should take to incorporate climate change considerations into their water resources activities. The interagency group is composed of engineers, scientists and water managers from USACE, the U.S. Geological Survey (USGS), the U.S. Bureau of Reclamation (BuRec), and the National Oceanic and Atmospheric Administration (NOAA) Climate Program Office.
- IWR also supported another interagency group that includes the U.S. Environmental Protection Agency (EPA), USACE, NOAA, USGS, BuRec, and the Department of Agriculture, Natural Resources Conservation Service (NRCS) and U.S. Forest Service, who have come together to cooperate in joint scientific and research efforts aimed at adapting U.S. water programs to address changing climatic conditions.
- IWR worked with other Corps offices and laboratories on the accelerated development and release of a revised [*USACE Engineer Circular \(EC\) on Sea Level Change*](#), which also reflected scientific collaboration with USGS and NOAA's National Ocean Service. The new EC is scheduled for release in FY 2009.
- IWR is also leading other USACE climate teams in developing more detailed field guidance on the application of the new EC on Sea Level Change for coastal planning, engineering and operation and maintenance (O&M) activities, and to put in place a process for evaluating the vulnerability of USACE coastal projects to climate change.
- In addition, as an outgrowth of the *Western States Watershed Study*, IWR is representing USACE in an intergovernmental partnership addressing the research needs for climate change impacts on the western waters of the U.S. The interagency team, known as the Climate Change and Western Water Group (C-CAWWG) was started by the Bureau of Reclamation, USGS western regions and NOAA, and IWR attended the C-CAWWG workshop in February 2008. USACE IWR has since become a full partner in C-CAWWG, and we are working together on several initiatives aimed at describing both the current (short-term) and long term climate change research and development challenges, needs, desired capabilities and "gaps" with regards to western waters.

In previous years IWR staff had developed protocols for national planning model certification in partnership with Corps laboratories and USACE Planning Centers of Expertise. As of 2008, the IWR Planning Suite Version 1.0.9.0, the NETS Global Grain Forecasting Model, and the NETS Survey Model were the first planning models certified by the Corps. In addition, the Global Grain and Survey models were concurrently used for the Upper Mississippi River – Illinois Waterway Navigation and Ecosystem Program (NESP) study. The application of these latter two models, both developed as part of IWR's

Navigation Economic Technologies (NETS) research and development program, were also subjected to independent technical review and external peer review as part of the NESP study, with both applications approved, affirming that the NETS research and development adequately responded to past criticisms by the National Academy of Sciences with regard to the theoretical assumptions, structure and inputs associated with the previous generation of inland navigation models.

Model certification began in 2008 on the IWR-HarborSym channel widening model, and the HEC-FDA, (Flood Damage Reduction Analysis) Version 1.2.4, a frequency-based model for the estimation of inundation damages, as both were submitted to the respective Centers of Expertise for certification.

International Water Resources: USACE played a highly visible role through its participation on the United Nations High Level Expert Panel on Water and Disasters, convened by the U.N. Secretary General's Advisory Board on Water and Sanitation in response to the unprecedented water-related events over the last decade. USACE Commander and Chief of Engineers Lieutenant General Robert L. Van Antwerp represented USACE on the High Level Expert Panel, along with the participation of Mr. Steven L. Stockton, HQUSACE Director of Civil Works, and Dr. Jerry Delli Priscoli of IWR. The USACE hosted the High Level Panel's fourth meeting in New Orleans in October 2008, with the High-Level Expert Panel to present its findings at the 5th World Water Forum in Istanbul, Turkey, in 2009.

The USACE Implementing Agreement with the River Bureau of the *Japanese Ministry of Land, Infrastructure, Transport and Tourism* (MLIT) was renewed for another five year term at a signing ceremony in Japan on 26 February 2008. To date, the technical exchanges have been quite productive, consisting of annual technical meetings and tours alternating between sites in the U.S. and Japan and with additional facilitation of personnel exchanges and requests for information between USACE and MLIT.

In FY 2008 IWR-HEC engineers continued to provide training in water resources engineering in Nairobi, Kenya and Addis Ababa, Ethiopia as part of the *Combined Joint Task Force – Horn of Africa* (CJTF/HOA) host nation agreement.

Internationally, IWR continued to conduct work in Iraq and Afghanistan. In Iraq, HEC entered into an MOA with the U.S. Embassy Baghdad/Iraq to provide training to the Iraqi Ministry of Water Resources on the application of the *Tigris-Euphrates Water Management Systems Model* (WMSM). Under previous contracts with the U.S. Agency for International Development, HEC developed and delivered WMSM and documentation to the Ministry and Embassy. Due to the need for additional training of Iraqi Ministry personnel, HEC entered into another MOA for additional training.

IWR and HEC staff participated in a modular portfolio of short courses on Integrated Water Resources Management (IWRM) that was organized with and hosted by UNESCO-IHE, Delft, The Netherlands. The course was a collaborative activity between UNESCO-IHE and IWR/ICIWaRM and was designed for engineers from the Iraq Ministry of Water Resources.

In Afghanistan, HEC developed an operations manual and performing a water budget analysis for the Kajakai Reservoir in the Helmand Valley of Afghanistan and prepared and delivered a final report entitled [*Water Balance and Regulation Alternative Analysis for Kajakai Reservoir Using HEC-ResSim*](#), December 2007, to the Afghanistan Engineer District.

IWR's specific accomplishments during FY 2008 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 tactical engagement of USACE senior leaders on these issues to stimulate "strategic thinking." Such critical thinking is seen as an essential prerequisite to strategy development and planning. IWR employs a variety of approaches to encourage strategic thinking, including the development of water resource outlook papers and the conduct of topic specific provocation sessions with senior leaders. Outlook papers on ecosystem restoration and hydropower were initiated in FY 2008. During FY 2008, IWR continued to use two innovative instruments to engage senior leaders strategically: the *Castle Forum* and the *Lunch Roundtable*. The *Castle Forum*, an off-site event for senior leaders and external thought leaders where they can engage in out-of-the-box thinking regarding subjects not usually addressed by them specifically, is intended to provide a venue for leaders to recognize (previously undetectable) weak signals for emerging issues and to anticipate potential implications. The *Lunch Roundtables* bring in water experts from outside the Corps to provide perspectives on issues familiar to senior leaders.

Castle Forum subjects explored during FY 2008 included alternative delivery of Federal services under severe budget constraints. The speaker proposed devolving delivery of flood risk management services to local and private (profit making and not-for-profit) organizations.

Lunch Roundtable topics included exploring prospects for Corps partnering with states and regional organizations to support integrated water resources planning and management, and developing opportunities with states to meet environmental challenges. The partnering discussion, along with previous IWR research, suggested a path to solving this complex problem. Pursuant to these efforts, the Corps is summarizing State Water Plans and conducting workshops with States and regional organizations to determine gaps and opportunities. During the discussion of environmental challenges, it was suggested Corps explore using its existing regulatory authorities and its project capability to encourage wise and safe use of flood plains.

Strategic Planning: The release of the inaugural Civil Works Strategic Plan in FY 2004 represented the culmination of a multi-year effort aimed at establishing a new direction for the Civil Works Program based on the contemporary IWRM watershed planning approach. The plan's five strategic goals were firmly grounded in the systems perspective of IWRM and are fully aligned with the principle of environmental sustainability. IWR FY 2008 strategic activities continued to address implementing the current Civil Works Strategic Plan (for FY 2004-2009) and building the conceptual foundation for the FY 2010-2014 Strategic Plan – *Sustainable Solutions to America's Water Resources Needs*. These activities included policy research, the preparation of multiple "white papers", the assembly of background material, the identification of emerging issues and new challenges, and the conduct of strategic engagements with senior leaders via Castle Forums and Lunch Roundtables.

In 2008 another strategic initiative was represented by the IWR preparation of the USACE Civil Works *Five Year Budget Development Plan* (FY 2009-2013), required by Congress. This plan demonstrated how the Corps budgets developed for FY 2009-2013 would meet the objectives of the FY 2004 Strategic Plan and included metrics to measure progress.

IWR contributed significantly to the drafting of the new *Civil Works Strategic Plan for 2010-2014*. The scenarios developed in FY 2006 and the results of a stakeholder outreach session held in FY 2007 were used to develop six robust cross-cutting strategies which formed the centerpiece of this draft plan. They are: 1) Systems approach; 2) Collaboration and partnering; 3) Risk informed decision making and communication; 4) Innovative financing; 5) Adaptive management; and 6) State-of-the-art technology.

At the same time, these cross-cutting strategies shaped the Civil Works strategic goals for the FY 2010-2014 draft plan, which represented a refinement of the goals within the previous plan. The draft goals were updated as follows: 1) Develop safe and resilient communities and infrastructure; 2) Promote sustainable water resources and healthy aquatic ecosystems; 3) Implement effective, reliable, and adaptive life-cycle project performance; and 4) Build and sustain a competent team. This draft strategic plan was completed in 2008 and is currently under review by HQUSACE and the OASA(CW).

The Institute's staff and Operations and Maintenance Business Information Link (OMBIL) national data management systems continued to support the formulation of the yearly budget guidance, the five-year development plan and the evaluation of USACE Civil Works program business areas in conjunction with the Office of Management and Budget (OMB) Program Assessment Rating Tool (PART) through the application of meaningful, outcome-oriented program performance metrics. Significant progress in the refinement of the performance metrics was made in 2008, along with a commensurate improvement in performance evidenced across the CW program, particularly in the inland navigation business line.

Interagency Performance Evaluation Task Force (IPET): The results of the analysis and technical documentation for the IPET Interior Drainage and Consequences tasks are included in IPET report "Volume VI: The Performance — Interior Drainage and Pumping" and "Volume VII: The Consequences."

The IWR-led Consequences Team also developed stage-damage and stage-fatality functions that provide estimates of direct property loss and life loss as a function of inundation elevations for different parts of the greater New Orleans area. These functions were used by the IPET Risk and Reliability team to develop estimates of the probability distributions of life loss and direct physical damage relating to the expected performance of the Hurricane Protection System in Greater New Orleans as of June 2007 associated with a wide range of possible hurricane events with different severities, directions, and points of landfall. In FY 2008, the New Orleans District published risk maps for the New Orleans area using the methodology developed by the IWR-led Consequences team.

Hurricane Protection Decision Chronology: The Hurricane Protection Decision Chronology (HPDC) investigation of the Greater New Orleans hurricane protection system was initiated at the direction of HQUSACE as a complementary activity to IPET. The HPDC provides a chronological record of planning, economic, policy, legislative, institutional and financial decisions that influenced the design, scale, configuration and condition of the Greater New Orleans hurricane protection system. The final report and database of source documents were posted on the IWR website in FY 2008.

Actions for Change: The Actions for Change Initiative (AFC) was developed to address the lessons learned from the Hurricane Katrina and Rita events. The goals of the Actions for Change were to improve public safety and the Nation's water resources infrastructure by providing expert and professional services to the Nation. The Actions for Change were 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 is actively participating 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), the Watershed Investment Decision Tool PDT, and the Multi-Objective System Planning and Policy PDT. IWR personnel are also members of the Sustainable Solutions PDT.

Theme 2 (Risk Informed Decision Making) includes tasks that collectively aim to infuse risk and reliability concepts into decision making through the lifecycle of Corps 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 Corps Chief Economist is leading the Theme 2 team and other IWR personnel are members of various Theme 2 PDTs. During FY 2008, USACE co-sponsored a workshop entitled “Workshop on Tolerable Risk Evaluation: A Step Towards Developing Tolerable Risk Guidelines for Dams and Levees”. Other workshop sponsors were the U.S. Bureau of Reclamation and the Federal Energy Regulatory Commission.

Theme 3 (Communication of Risk to the Public) emphasizes the communication of flood risks to the public and public involvement in flood risk management decision making. Initiatives will focus on concepts of residual risk and the involvement of disadvantaged populations that are most likely to be impacted by floods. IWR is leading the Public Involvement sub-team, and is presently partnering with the National Flood Risk Management team to develop a framework for public involvement in flood risk management decision making.

Intergovernmental Panel on Climate Change: The Institute has been involved in climate change impacts analysis and research since 1978. In 1988, the World Meteorological Organization and the United Nations Environment Programme, recognizing the need for an objective, balanced, and internationally coordinated scientific assessment of the understanding of the effects of increasing concentrations of greenhouse gases on the earth’s climate and on ways in which these changes may impact socio-economic patterns, established the Intergovernmental Panel on Climate Change (IPCC).

In FY 2008, the Norwegian Nobel Committee awarded the Peace Prize to the Intergovernmental Panel on Climate Change. For his many contributions to the IPCC, Dr. Eugene Stakhiv, IWR, was honored by the Nobel Committee and shared in the Nobel Peace Prize in December, 2007.

Adaptations to Climate Change: During FY 2008 IWR accelerated its work on the development of a framework for addressing USACE adaptations to climate change. The objectives of the initiative are to develop consistent water management adaptation policies and approaches to address global change, including global warming along with other changes due to demographics, land use, evolving societal values, etc., throughout USACE Civil Works and in partnership with the other Federal water resources agencies.

The project will provide recommendations for policy and guidance to prepare for, and respond to, climate change and variability. An interagency group was formed to consider what actions Federal water agencies should take to incorporate climate change considerations into water resources activities. The group is composed of representatives from USACE, the U.S. Geological Survey (USGS), the U.S. Bureau of Reclamation (BuRec), and the National Oceanic and Atmospheric Administration (NOAA) Climate Program Office. A joint report, [*Climate Change and Water Resources Management: A Federal Perspective*](#) is scheduled to be released in FY 2009.

IWR also supported another interagency group that includes the U.S. Environmental Protection Agency (EPA), USACE, NOAA, the USGS, the Bureau of Reclamation, and the Department of Agriculture, Natural Resources Conservation Service (NRCS) and U.S. Forest Service. The objective of this group is to cooperate in scientific and research work to adapt water program management to reflect changing climatic conditions. IWR scientists provided technical support to the Assistant Secretary of the Army (Civil Works) for this interagency group, with the ASA(CW) entering into a multi-lateral MOU on behalf of USACE as the instrument for providing a formal charter for the effort.

The IWR “Adaptation to Climate Change” effort is working closely with the “Actions for Change” initiative. A draft Engineer Circular on sea level change was written with NOAA and USGS. Other teams have been formed to develop more detailed guidance for coastal planning and engineering and to evaluate the vulnerability of USACE coastal projects to climate change. In addition, a team of water managers and hydraulic engineers was formed to develop a strategic plan for how USACE water managers should deal with climate change.

Louisiana Coastal Protection and Restoration (LACPR): During FY 2008 IWR continued to provide technical assistance to the Corps’ New Orleans District and Mississippi River Division on the Congressionally authorized LACPR study. In partnership with the Engineer Research and Development Center (ERDC), a small team of risk analysis experts developed a decision framework that weaves together quantitative risk assessment, scenario planning and risk-informed decision making with active and transparent stakeholder involvement. IWR senior staff outlined a process to integrate risk-informed planning within the traditional six-step planning process, then led workshops for LACPR staff to enhance understanding and advance the implementation of the planning framework for coastal Louisiana. IWR also advised the LACPR study team on best planning practices, and an IWR senior social scientist led the formulation and evaluation of non-structural components to the comprehensive risk reduction strategies. This combined effort served a complementary purpose of developing a nationally consistent risk-informed planning framework to support implementation of the risk-based concepts in planning, design, construction, operations, and major maintenance action of Actions for Change. IWR involvement was concentrated on implementation, using the LACPR study as a test-bed demonstration.

USACE Chief Economist: Dr. David Moser of IWR is the USACE Chief Economist and leader of the Economics Community of Practice (CoP). During FY 2008, the Chief Economist continued to provide support to the IPET Risk and Reliability team.

The Chief Economist’s leadership engaged to build and advance the economic analysis capability across the USACE, holding two national meetings 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 Chief Economist also participated in over a dozen selection boards for senior economists throughout USACE.

As a complementary activity to building capacity, IWR focused on enhancing technical guidelines and economic manuals available to field practitioners. In FY 2008 work proceeded on the update of water resources planning National Economic Development (NED) Manuals.

In FY 2008, the Chief Economist also continued as the National Team Lead for *Theme 2 - Risk Informed Decision Making*, one of the four themes of the *Actions for Change* initiative. 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. He was also involved in issues relating to National Economic Development evaluation of transportation externalities, agricultural water supply and value of time saved.

National Shoreline Management Program: The National Shoreline Management Program, 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 program 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 program 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.

Initiatives and events have influenced the future course of national shoreline management program. These include the formation of a Committee on Ocean Policy and an associated new ocean governance structure; U.S. Geological Survey publication of the results of shoreline change studies; the initiation of a National Coastal Data Bank; joint coastal mapping initiatives; emerging joint Federal coastal science and technology collaborations; and the formation of regional coastal collaborations to address ocean and coastal management in an ecosystems context.

The study management team has engaged partner agencies in discussions of how the study could best serve and synchronize these ongoing initiatives to improve agency program integration and effectiveness with emphasis on systems approaches to Federal and non-Federal roles in shoreline management. In FY 2008, the study team prepared an interim report that summarizes study products and results of other relevant initiatives and made recommendations for next steps towards producing a final report.

Policy Development: The Water Resources Development Act of 2007 (Public Law 110-114, Section 2031) restated national policy objectives for water resources projects and directed the Secretary of the Army to revise the 1983 Principles and Guidelines that state how these objectives should be accomplished. The Assistant Secretary of the Army (ASA (CW)) responded in behalf of the Secretary. IWR staff composed the bulk of the subject matter experts serving on the Corps internal P&G review team, and IWR assisted in organizing the OASA(CW) hosted public meeting in June 2008 to solicit agency and stakeholder views and comments on the 1983 version of the P&G, and then participated with HQUSACE in preparing a draft version of a new Principles and Guidelines. A draft set of Principles were subsequently published in September 2008. IWR also participated in the analysis of the comments received in response to the public meeting.

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 focus has long been as the intellectual nexus for USACE expertise on collaboration, partnering and public participation. In FY 2008 the Corps took several important steps towards official recognition of that role with funding for a [Center for Conflict Resolution and Public Participation](#), along with formal designation of the center in 2008. As an important part of this role, 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.

In FY 2008 IWR shepherded a review of current practices in environmental conflict resolution and continued the National Cooperative Modeling and Collaborative Planning Demonstration Programs with multiple Federal, state, university and non-governmental partners. Of particular note, IWR led the development of an interagency federal initiative on the intersection of computer tools and multi-stakeholder collaborative water resources management processes. In FY 2008 the [proceedings](#) of an IWR led interagency workshop on Computer Aided Dispute Resolution (CADRe) were published.

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. IWR actively participated in the development of the SWAQ Strategic Plan for Federal interagency R&D to ensure adequate water availability and quality: *A Strategy for Federal Science and Technology to Support Water Availability & Quality in the United States*, and is leading development of the resultant interagency Federal Initiative on Collaborative Tools and Processes for U.S. Water Solutions.

IWR also developed a handbook on collaborative planning in support of HQUSACE, led execution of Corps-wide Memoranda of Agreement (MOA's) and Memorandum of Understanding (MOU's) and engaged 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 HEC).

National Partnerships: 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. In FY 2008 IWR initiated new MOU's and renewed existing agreements with various federal partners.

Natural Resources Conservation Service Partnership: In FY 2008 an existing [partnership](#) agreement with the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS) was renewed. The partnership agreement was initially signed between the Corps and the NRCS on July 7, 2005. The purpose of the agreement is to promote a long-term working relationship and collaborative effort to improve the management of water and related natural resources under the missions and authorities of the NRCS and USACE. Collaboration continues to focus on three areas: (1) watershed planning and implementation; (2) wetland creation, restoration and enhancement and (3) natural disaster recovery. The agencies agreed to coordinate other programs and activities, including the Wetland Conservation Compliance (the *Swampbuster* provision of the Farm Bill) and the Regulatory Program (Section 404 of the Clean Water Act).

FY 2008 accomplishments included implementation and updating of the action plan that was developed in 2007. In June 2008 Senior Leaders from both agencies reviewed progress and concurred on the Action Plan.

An interagency agreement was put in place for IWR's Hydrologic Engineering Center to work with NRCS agronomists to include agricultural damages in the Flood Damage Assessment model (HEC-FDA), and to reestablish technical support for NRCS employees using HEC's RAS model. NRCS is also participating in the Interagency Levee Task Force and Missouri River basin activities led by USACE.

U.S. Institute for Environmental Conflict Resolution (USIECR): In FY 2008 the Institute entered into a [MOU](#) with the USIECR. The USIECR was established through the Environmental Policy and Conflict Resolution Act of 1998 (Public Law 105-156), as an independent federal entity with the mission to impartially assist in the resolution of federal environmental, natural resources and public land conflicts and controversies through facilitated negotiation, mediation, and collaborative problem-solving. IWR and USIECR have a common interest in the areas of IWRM, water security, and environmentally sustainable development. The MOU focuses on areas encompassing the advancement of techniques for and the facilitation of interagency and intergovernmental negotiations and collaborative planning efforts; process design and related technical and/or advisory assistance on collaborative USACE projects; technical assistance on a broad range of environmental conflict resolution and computer assisted dispute resolution techniques, such as shared vision planning (SVP); and advancing of Federal agency capacity in alternative dispute resolution (ADR) through training and technology transfer.

U.S. Geological Survey Partnership: Significant activities for the U.S. Geological Survey [MOA](#) included 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 on the status of regional and international water studies, such as on the Great Lakes. The major joint USACE-USGS initiative in 2008 expanded into a multilateral effort involving technical and scientific staff from four federal agencies, including the two primary Federal water development agencies – USACE and the Bureau of Reclamation, and the two principal water science agencies - the USGS, and NOAA, on the development of nationally consistent approaches for incorporating the adaption to global climate change into water resources management. The resulting report is expected to be jointly published by all four agencies in FY 2009. USACE also partners with 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 IWR Director is the designated USACE representative on the U.S. National IHP Committee.

U.S. Bureau of Reclamation Partnership: Significant FY08 activities with the U.S. Bureau of [Reclamation](#) included senior level meetings addressing climate change and water resource issues and the development of consistent approaches to climate change science throughout USACE and in partnership with other Federal agencies. USACE is working closely with Reclamation on the Climate Change and Western Water Group (C-CAWWG), which also includes representation from USGS and NOAA scientists as core members. The 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.

Oak Ridge National Laboratories Partnership: During FY 2008 IWR continued to implement the [MOU](#) executed with the U.S. Department of Energy's Oak Ridge National Laboratories and ERDC in 2005 that centers on energy, security and environmental sustainability. Thrusts of the agreement include joint work on regional energy and water management, transportation modeling, emergency response, homeland security and environmental sustainability.

Other Partnerships: IWR is working closely with Sandia National Laboratories through the National Cooperative Modeling Demonstration Program.

Academic and Professional Practice Partnerships

Universities: In FY 2008, IWR continued to expand its partnership with academic institutions, professional organizations and non-governmental organizations. IWR entered into Memorandum for Understanding ([MOU](#)) with the Colorado State University, International School for Water Resources/Civil and Environmental Engineering Department.

This 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 changes and their impacts on water resources, and methods for understanding and managing extreme hydrological events and related natural hazards and disaster preparedness.

Each of the universities with which IWR has entered into MOUs has unique program features that compliment the strengths and talent of the Institute.

The [University of Arizona](#) 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's](#) *Institute for the Study of Earth, Oceans, and Space (EOS), Water Systems Analysis Group*, which focuses on the understanding of water resources issues on a global scale and the application of technological improvements in water resource management, allows 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's](#) *Institute for Water and Watersheds*, which focuses on integrated water resource management, sustainable development, ecological design, ecosystem restoration and environmental conflict resolution, allows 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.

Professional Practice Organizations: In FY 2008 the Institute entered into an [MOU](#) with the *American Water Resources Association* (AWRA). Both the Institute and the AWRA have a common interest in integrated water resources management, environmentally sustainable development, and water resources education, technology transfer and capacity building. The MOU will further both organizations' goals of enhancing the use of effective water resources development and management policies, and will establish a long term cooperative effort in a number of areas including the field of integrated water resources development and management; hydrologic, hydraulic and water resources systems analysis modeling; ecosystem analysis and design; and capacity building, including training and technology transfer.

In FY 2008 the Institute entered into an [MOU](#) with the *Global Water Partnership*, an international network of organizations involved in water resources management. The *Global Water Partnership* was established in 1996 by the World Bank, the United Nations Development Program, and the Swedish International Development Agency, and is headquartered in Stockholm, Sweden. The MOU will further

both organizations' goals of developing procedures and methods for integrated water resources management in support of sustainable development, adaptation to global climate change and its impacts on water resources, and will establish a long term cooperative effort in a number of 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, including training and technology transfer.

FEMA Silver Jackets Program: The *Silver Jackets Program* is a key mechanism for achieving the interagency coordination necessary to fulfill the goals of the National Flood Risk Management Program.

Through the *Silver Jackets Program*, managed by IWR, the USACE cooperates with FEMA and other Federal, State and sometimes local agencies to ensure continuous interagency collaboration at the state level, leveraging available resources and information between agencies.

The program has created a mechanism to collaboratively solve issues and implement or recommend those solutions, while increasing and improving flood risk communication and outreach through the united effort. Silver Jackets teams facilitate strategic, life-cycle planning to reduce flood risk and provide assistance in implementing state-identified high-priority actions

FY 2008 accomplishments include the following:

Indiana Inundation Pilot Study: By bringing together the participating agencies, the Indiana Silver Jackets team (established in 2006) was able to pair up technologies normally not used together to identify flood areas and when those areas would be impacted through the use of real time river gauge data. In FY 2008 the pilot study successfully calibrated the model against actual river flow data for the White River in Indianapolis. Model outputs can now be integrated with the HAZUS damage model, and GIS and local Property Valuation Administration (PVA) databases. This allows local agencies to quickly determine where to focus flood fighting efforts and to quickly provide reliable post flood damage estimates. Outputs can be read in real time on a web based system. This should also allow citizens to be more responsible for their own safety as they will be able to monitor flood progression and plan accordingly. The cost for setting up this system on a typical gauged stream is relatively low, on the order of less than \$25,000 per stream mile. In FY 2009 and FY 2010 this system will be expanded to cover as many as 20 other gauged stream locations within Indiana, subject to availability of funding.

Indiana Risk Communication: The Silver Jackets team participated in the update to the Indiana State Hazard Mitigation Plan mandated by FEMA. This participation by the member Silver Jackets agencies allowed the Indiana Department of Homeland Security (IDHS) to prepare a more comprehensive and accurate mitigation plan for their state. The group also continued with prior year education efforts to reach out to children to educate them about flooding and severe weather and the measures they and their families can take to assure personal safety. This project involved a number of the member agencies in the distribution of the activity book materials and outreach to various groups specifically working with children throughout the State.

Response to May/June Flood 2008 Disasters: The Indiana Silver Jackets group assumed the role of the Interagency Levee Task Force in Indiana. Sharing time critical information was one of the biggest efforts. One example was where the U.S. Department of Agriculture contacted the local Corps district office regarding emergency watershed work (streambank and debris removal) for central Indiana. Within a matter of days, the Corps office had prepared and supplied to USDA estimates for the performance of various requested activities. In another case, the Indiana Department of Homeland Security (IDHS) requested a listing and map identifying which dams and levees in Indiana the Corps could support with repairs. Within one day, the local Corps district office provided a list of the projects that would qualify

for Corps aid, as well as those projects that would not qualify. The Corps also supplied IDHS with the list of those communities that had already contacted the Corps for help. Coordination of post flood responses by the agencies in Silver Jackets has been significantly speeded up and streamlined by their cooperative efforts.

Marietta, Ohio: Coordination through the Ohio Silver Jackets team (established in 2005) has enabled the small community of Marietta to acquire detailed mapping of its community at nominal cost by tapping into an ongoing regional watershed study. These maps are used daily by the City. Through the same Silver Jackets team, an opportunity was discovered to utilize the USACE Planning Assistance to States (PAS) program to provide the initial resources to develop the City's first Flood Hazard Mitigation Plan which will enable them to gain eligibility for FEMA flood mitigation funds. Also as a result of this effort, the City obtained a \$200,000 community development block grant in FY 2008 from the U.S. Department of Housing and Urban Development for "duckbill" backflow prevention for several storm sewer outfalls at the Ohio River. The Silver Jackets team is also working on an ongoing Section 205 Flood Warning System for Washington and Noble Counties that includes areas in Marietta. Life saving rain and stream gauges will be installed for early flash flood detection and warning.

Ohio Web-Based Portal: The Ohio Silver Jackets team is currently focused on research and development for a portal that will allow all collaborating agencies to contribute data on their "piece of the puzzle". The focus is on water resource studies and construction work in the state of Ohio. This has the potential to expand to other areas as a regional collaborative architecture for communication. The vision is a web based portal with both public and private permissions. Marshall University (Huntington, West Virginia) is assisting in this effort.

The *Silver Jackets Program* continues team development on a state by state basis, with the ultimate goal of offering a team to every state. In FY 2009, efforts are planned to initiate or supplement existing teams in the states of Idaho, Kansas, Hawaii, Texas, Louisiana, New Mexico, Kentucky, Illinois and Missouri. At least one team is anticipated in both North Atlantic and South Atlantic Divisions.

Ocean Action Plan: The USACE is participating in implementation of the *President's Ocean Action Plan* through integrated networks and partnerships of Federal, state, local, territorial and tribal authorities, the private sector, international partners and ocean communities. In 2008, IWR coordinated USACE participation in regional ocean governance initiatives, co-leading USACE support to the Gulf of Mexico Alliance with ERDC. The Corps is one of thirteen Federal agencies supporting the Governors' Action Plan for Healthy and Resilient Coasts. IWR staff participated in the development and review of material for the *West Coast Governors' Ocean Health Agreement*, and led USACE participation in the Subcommittee on Management of Ocean Resources (SIMOR), engaging other USACE staff depending upon the issues raised to the Subcommittee. Through participation on the Council on Environmental Quality, National Science and Technology Council's Joint Subcommittee on Ocean Science and Technology, IWR staff contributed to development of the Ocean Research Priorities Plan and its implementation strategy, and to projecting the need for new ocean research facilities.

National Ocean Service Partnership: The USACE and the National Oceanic and Atmospheric Administration's National Ocean Service (NOS) formed a collaborative partnership as an outgrowth of Ocean Action Plan initiatives, calendar year 2005 post-storm experiences, and recognition of mutually beneficial advances and synergies that could be affected through collaboration. The partnership is leveraging each agency's programs and talents through joint centers for coastal mapping, instrument testing, evaluation and training; improving data sharing capabilities; coordinating vertical datum systems and improving tidal measurement and information; and improving natural hazard risk communication that incorporates consideration of community resilience. In 2007, the partnership initiated leveraging the NOS

coastal resiliency initiatives with the Corps Flood Risk Management Program. In 2008, the partnership focused heavily on implementing the waves plan for the Integrated Ocean Observing System (IOOS).

Interagency Committee on the Marine Transportation System: The Corps continues coordinating with the Maritime Administration (MARAD), National Oceanic and Atmospheric Administration (NOAA), the Coast Guard and other Federal departments and agencies to support the *Committee on the Marine Transportation System* (CMTS), which was initiated in July 2005. The Corps' Director of Civil Works was selected as the initial chair of the Coordinating Board for the CMTS and the Assistant Secretary of the Army (Civil Works) was designated as the Department of Defense principal to the CMTS. The Coordinating Board chair rotated to the Administrator of NOAA in 2007, to the Maritime Administrator in 2008, and will rotate to the Commandant of the Coast Guard in 2009. IWR provides logistics support and participates on Integrated Action Teams, including leading the team to develop an assessment of the Marine Transportation System. A contract was awarded to the Department of Transportation's Volpe Center in 2007 to assist with the assessment and work continued throughout 2008. This effort is scheduled to complete in 2009.

Regional Sediment Management: The USACE has adopted the Regional Sediment Management (RSM) approach in carrying out many of its programs. Sediment management spans the USACE Navigation, Flood and Coastal Storm Damage Reduction, and Ecosystem Restoration missions and responsibilities. The RSM approach implements the watershed perspective and the principles of integrated water resources management. The USACE applies this perspective and approach as a major stakeholder in many of the Nation's inland and coastal watersheds. In 2008, IWR staff continued work on guidance for implementing the RSM approach, and initiated coordination with the Continuing Authorities Program staff implementing the new RSM provisions provided to the Section 204 program by WRDA 2007 (Public Law 110-114, Section 2037). IWR staff also continued to support development of Gulf Region Sediment Management Master plan to support the Gulf of Mexico Alliance.

Coastal Engineering Research Board: The CERB provides broad policy guidance and review of plans and requirements for the conduct of research and development in support of coastal engineering and the objectives of the Chief of Engineers. In 2008 IWR supported the Director of Civil Works in organizing the CERB visit to the Mississippi and Louisiana coastlines regarding flood risk management and coastal protection, and reporting to the Chief of Engineers on their findings. The Board also visited Portland, Oregon to look at other aspects of system applications.

Environmental Advisory Board: IWR has led the USACE technical team supporting the Chief of Engineers Environmental Advisory Board (EAB) since FY 2004. In FY 2008, the EAB embarked on a theme of exploring field level outreach and internal implementation of the Corps *Environmental Operating Principles* (EOP). This theme emerged from a series of ecosystem restoration topics the Board was engaged in during FYs 2006 and 2007. The Board held one public meeting in FY 2008 — 30 April 2008 in Seattle, Washington — which provided the Board the opportunity to meet with Corps Seattle District staff to discuss how the district has implemented the EOP's. The Board also met with local area environmental non-governmental organizations to discuss their views as to how the District has implemented the EOP's.

Inland Waterways Users Board: IWR continued its technical and administrative support of the *Inland Waterways Users Board* (IWUB) in FY 2008, including the analysis of and reporting on the financial status and capability of the Inland Waterway Trust Fund, assistance with drafting of the IWUB Annual Report to Congress, evaluation of candidates nominated for Board membership and the administration of three IWUB meetings including No. 56 on November 2, 2007 in Quincy, IL, No. 57 on March 27, 2008 in Baton Rouge, LA, and No. 58 on July 31, 2008 in Walla Walla, WA.

Collaborative Planning: IWR has a long history both of applying collaborative modeling tools through its signature Shared Vision Planning (SVP) process, and in developing tools and providing technical assistance

in conflict resolution and public participation. During FY 2008, IWR continued to focus on developing new conceptual and methodological foundations, building awareness of collaborative planning tools, and assisting Corps offices and states in improving public participation in water resources planning and decision making.

FY 2008 activities included laying groundwork for the creation of the Institute's Center of Expertise in Conflict Resolution and Public Participation with a strong emphasis on computer aided dispute resolution using the *Shared Vision Planning* methodology. IWR initiated a Corps-wide assessment of collaborative capacity and surveyed Districts on their use of third-party neutrals in environmental conflict resolution cases as part of a White House mandate. In conjunction with Theme 3 of *Actions for Change* (Communication of Risk to the Public) and the National Flood Risk Management program, IWR led the development of a framework for Public Involvement in Flood Risk Management.

Other activities included the development of the Collaborative Planning Toolkit, research papers on the future of collaboration in modeling, a book chapter on Shared Vision Planning, and publication of the proceedings of the workshop entitled "*Computer Aided Dispute Resolution: Proceedings from the CADRe Workshop, Albuquerque, New Mexico, September 13-14, 2007*" as IWR Report 07-R-6.

In the area of technology transfer and outreach, IWR staff members delivered presentations and training at the Corps Planning Conference, the national Environmental Conflict Resolution Conference, the American Water Resources Association annual meeting, Western States Water Council meetings, Corps PROSPECT training classes, the Chesapeake Modeling Forum, and other venues. FY 2008 saw the development of a website and Sharepoint collaborative workspace for *Shared Vision Planning*, as well as the development of a primer and video on the use of Shared Vision Planning in the 404 permitting process for water supply. IWR worked with partners at the Department of Interior, Center for Alternative Dispute Resolution, the USEPA, Conflict Prevention and Resolution Center, and the U.S. Institute for Environmental Conflict Resolution on Performance Measures for Collaborative Modeling. IWR also initiated and is chairing the American Society of Civil Engineers committee on Best Practices for Collaborative Modeling.

During FY 2008 IWR provided technical assistance to the State of California's Department of Water Resources in development of the State Water Plan. Assistance included leading a workshop on *Shared Vision Planning*, as well as presentations to the Water Plan Advisory Board and to the State Water Analysis Network and process design assistance. In conjunction with the Western States Watershed study and the Western States Water Council, IWR supported the Omaha District in a test case for the potential use of *Shared Vision Planning* in the 404 regulatory process for water supply permitting on the Cache la Poudre river in Colorado. Corps support transitioned to a full pilot project that is financially supported by funds from cities, the state and non-governmental organizations. IWR continued to provide support to Portland District in conjunction with Sandia National Lab and local partners on integrated modeling to understand linkages between reservoir operations, water quality, ecology and economics on the Willamette River in the State of Oregon.

The Nature Conservancy Sustainable Rivers Project: Begun in July 2002, 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 nationwide effort to modify operations of Corps 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. Sustainable Rivers is working towards its goals through a combination of partnered 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, where methods used in Sustainable Rivers are now being applied in Asia, Africa, and South America. In 2008, the USACE received The Nature Conservancy's Outstanding Partner Award in recognition of the broad and successful partnership between the two organizations.

National Flood Risk Management Program: In May of 2006 in an IWR-led effort, the USACE established the *National Flood Risk Management Program* 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 to protect the public and reduce flood risk. The objectives of the NFRMP are to:

- Provide current and accurate floodplain information to the public and decision makers at the national, regional and local levels.
- Identify and assess flood hazards posed by aging flood damage reduction infrastructure.
- Improve public awareness and understanding of flood related hazards and risks.
- Coordinate flood damage and flood risk reduction programs across local, state, and federal agencies, and
- Improve capabilities to collaboratively deliver and sustain flood damage reduction and flood risk mitigation services to the nation.

Since its inception, the National Flood Risk Management Program continues to build on coordination work that has already taken place between USACE and FEMA to ensure consistent communication to the public on FEMA's *Flood Mapping Modernization (MapMod)* Program and related flood risk issues and to leverage resources when working on similar activities or within the same geographic area. Some of the specific accomplishments that have taken place under the umbrella of the National Flood Risk Management Program include:

- Improved coordination between FEMA and USACE programs through quarterly meetings of an Intergovernmental Flood Risk Management Committee (IFRMC), which provides a venue for FEMA and USACE leadership to coordinate programs and policies, and thus improve program implementation for the flood risk management community.
- Improved coordination and pursuing collaborative opportunities with other Federal agency partners through a *Flood Risk Management Task Force*. The Task Force is responsible for updating and maintaining a unified national program for floodplain management; coordinating agency policies for flood risk management; identifying and recommending actions of the federal government necessary to reduce losses due to flooding and protect the safety of flood plain residents.
- Expanded coordination between USACE headquarters and FEMA headquarters to ensure that current and future policies for flood risk mapping, certification and other flood risk related policies are fully coordinated and compatible with each agency's programs.
- Established the *Regional Interagency Levee Task Force (ILTF)* in response to the catastrophic floods in the upper Midwest in 2008. The ILTF enabled a joint Federal-state partnership to address expedited repair of damage levee systems in the upper Midwest and identify non-structural mitigation measures that could be implemented during recovery to reduce future flood risks. The ILTF included regional representatives from the U.S. Army Corps of Engineers, Federal Emergency Management Agency, Environmental Protection Agency, Economic Development Administration, U.S. Fish and Wildlife Service, Natural Resource Conservation Service, United States Geological Survey, U.S. Small Business Administration, Department of Housing and Urban Development, and representatives from the States of Iowa, Illinois, Wisconsin, Missouri and Indiana.

- Policy work, through the “Wise Use of Flood Plains” study, to identify any procedural or legislative changes that may be warranted to allow the Corps of Engineers to be more effective in working with other Federal agencies, states and local governments and stakeholders in the management of flood risk. 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.

IWR Visiting Scholar Programs: The Institute benefits from supporting a number of visiting scholar programs. These programs seek to bring the foremost water resources experts from academia, private industry and other agencies and laboratories to residence at IWR or HEC for periods of six months to one year. Visiting scholars are expected to infuse new energy, perspectives and ideas to the IWR program, while the practical work environment at IWR and HEC provides a stimulating context for mutual exploration of potential advances in water resources planning and hydrologic engineering and analysis.

FY 2008 marked the seventh year of the Institute’s Maass - White Visiting Scholar program, established in 2001 in recognition of the contributions of, and the Institute’s intellectual alignment with, two of the founders of modern water resources planning’s theoretical underpinnings — Professors Arthur Maass of Harvard University, and Gilbert White of the University of Colorado. FY 2008 was the fifth year for two other designated visiting scholar positions, both established in 2004: the first a partnership with the Universities Council on Water Resources (UCOWR) and the second, HEC’s Leo R. Beard Visiting Scholar program, named after the founding director of HEC. FY 2008 marked the third year since the establishment 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 and HEC underwent a rigorous certification process by independent reviewers in order to qualify for these two prestigious programs.

In FY 2008, Dr. Yacov Haimes, the Lawrence R. Quarles Professor of Engineering at the School of Engineering and Applied Science, University of Virginia continued as the Maass-White Fellow for the period of 2007-2008. Dr. Haimes is engaged in risk analysis and risk informed decision making as part of the Actions for Change initiative.

Dr. Paul Kirshen of the Department of Civil and Environmental Engineering, Tufts University was named as the 2007–2009 Universities Council on Water Resources (UCOWR) Visiting Scholar. Dr. Kirshen’s work is advancing Shared Vision Planning.

Dr. David W. Watkins, Jr. of the Department of Civil and Environmental Engineering, Michigan Technological University was named as the Leo R. Beard Visiting Scholar for 2008 at HEC. Dr. Watkins’ research focused on the next generation of the Corps risk analysis procedures for flood damage reduction and decision making under uncertainty.

Dr. Stacy Langsdale, Ph.D. in Resource Management Environmental Studies, University of British Columbia continued at the Institute as a National Research Council Research Associate for 2007-2009. Dr. Langsdale’s research focus is in the field of modeling and stakeholder based decision support processes as they apply to water resources planning and management.

Dr. Michael Deegan, Ph.D. in Public Policy and Administration, University of Albany joined the Institute as a National Research Council Research Associate for 2008-2009. Dr. Deegan’s research focus will be in the field of flood risk management and the factors influencing policy formulation, adoption, and implementation.

Dr. Kenneth Strzepek, Professor of Civil, Environmental, and Architectural Engineering at the University of Colorado at Boulder, will join the Institute in 2009 as the next Maass- White Visiting Scholar for 2009-2010. Dr. Strzepek's research will focus in the area of climate change and adaptation of water resources.

Previous IWR visiting scholars have included:

- 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), and Dr. Yacov Haimes, University of Virginia (2007-2008).
- UCOWR Fellow: Dr. Bruce Hooper, Southern Illinois University (2004-2005).
- Leo R. Beard Visiting Scholar: Mr. Tony Thomas, founder and president of Mobile Boundary Hydraulics (2004); Professor Jerry Stedinger, Cornell University (2005).
- IWR NRC Research Associate: Dr. Peter Rogers, Colorado State University (2006), Dr. Jason Giovannattone, Duke University (2006, at HEC).
- AAAS Fellow: Dr. Alexey Voinov, University of Vermont, (2006-2007).

As part of Dr. Voinov's work at IWR as an AAAS Fellow, Dr. Voinov authored a paper: "*Energy-Water Nexus: Why Should the Corps Care?*" published in August 2008 as IWR Report 2008-VSP-01.

WATER RESOURCES METHODS AND MODELS

Two major IWR focus areas are (1) the evaluation of engineering, economic, social, institutional and environmental needs and, to address those needs, (2) the development, transfer and application of improved water resources analytical techniques, models and information systems. 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 means of programs in research, training, planning analysis and technical assistance.

Planning Models Improvement Program: HQUSACE guidance EC 1105-2-407, *Planning Models Improvement Program: Model Certification*, published in 2005 prescribed a corporate business process and policy for the development, certification, training and on-going support for planning models, with the certification process based on internal and external peer support and review and with the responsibility for establishing priorities and managing the certification process residing with the planning centers of expertise in coordination with the findings of the *Strategic Engineering and Technology Initiative*. In FY 2006 IWR, with input from Corps laboratories and the planning centers of expertise, developed protocols for model certification that include the processes and criteria to be used for certifying planning models. In FY 2008, IWR Planning Suite Version 1.0.9.0 was certified to be in compliance with the requirements of the *Planning Models Improvement Program*. Also in FY 2008, HEC-FDA, (Flood Damage Reduction Analysis) Version 1.2.4, a frequency-based model for the estimation of inundation damages, was submitted for certification by the Hydrologic Engineering Center.

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

Navigation Economic Technologies Research: 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 up and down our Nation's rivers and out to sea via coastal ports. The Navigation Economic Technologies (NETS) Research Program supports the navigation mission by developing state-of-the-art, credible, independently verified economic models, tools and techniques to be used by USACE field planners in informing investment decision making at all levels of the agency. The knowledge and tools developed by the NETS research program are based on reviews of economic transportation and market theory, current best practices both within and outside of the USACE; data needs and availability; and peer recommendations.

In FY 2008, the NETS developed tools and techniques began their transition to field use:

- The Global Grain forecasting model was certified by the Corps and used for the *Upper Mississippi River – Illinois Waterway Navigation and Ecosystem Program* (NESP) study.
- The Survey Model was also certified by the Corps and used for the NESP study. The Survey model incorporates the findings of NETS shipper response research, directly responding to criticisms made by the National Academy of Sciences to the structure and inputs of previous models.
- The channel widening version of the HarborSym model continues to be used by Corps districts. Model certification has begun on the HarborSym channel widening model. The NETS team is extending HarborSym functionality to include channel deepening analysis for bulk carriers.
- Prototypes for suite modules have been developed for the *Navigation System Simulation* (NaSS).
- NETS' shipper response research (also known as the "Wilson-Train" Technique) is being incorporated into Corps legacy models. Working with the Planning Center of Expertise for Inland

Navigation, NETS has completed a survey to estimate the shape of the shipper response curves on the Ohio River. The NETS team is working in conjunction with the Oak Ridge National Laboratory and the Planning Center of Expertise for Inland Navigation to incorporate these results into the *Ohio River Navigation Investment Model* (ORNIM).

- NETS researchers continue to develop techniques to evaluate and forecast container freight traffic.

The NETS program is scheduled to conclude in 2009. The focus is to complete and transfer the tools and techniques developed by the NETS Research Program to the Planning Centers of Expertise for Inland and Deep Draft Navigation. The NETS web site www.nets.iwr.usace.army.mil is being updated and finalized as a publicly available archive of the research program.

Environmental Sustainability: The Environmental Sustainability Project, managed by Dr. Richard Cole, includes activities that pertain to the implementation of the *Environmental Operating Principles* (EOP) and sustainable solutions in the USACE. Development of a framework for achieving environmental sustainability has been completed in draft and awaits final internal review. An assessment of the condition of freshwater biodiversity at Federal water resources projects continues to be reviewed before final approval for publication. A new metric for measuring the benefits from ecosystem restoration projects has been developed and two technical reports are being readied for publication by ERDC. A third technical report, in review, compares the new metric with other metrics now used for ecosystem restoration benefits estimation. A technical note and a journal article draft are now in review. A report on the concepts of sustainability, developed under the leadership of Dr. Cole by the Sustainable Solutions project development team of the Actions for Change initiative is undergoing internal review. Another Sustainable Solutions project development team report on the status of sustainability in the USACE is under development.

IWR Planning Suite: Version 1.0.9.0 was certified in compliance with the requirements of the Planning Model Improvement Program (PMIP) guidance. This model is a water resources investment decision-support tool that performs cost effectiveness and incremental cost analyses associated with the formulation and evaluation of planning alternatives that produce non-monetary or a combination of monetary and non-monetary outputs. Originally designed to assist with the development and comparison of alternative plans for ecosystem restoration and watershed planning studies, the program can also be applied to a wide variety of integrated water resources planning and management problems by identifying which plans are the best financial investments, then displaying and comparing the effects of each plan on a range of decision variables. Training in the software was delivered to the New Orleans District. Two new modules were developed further based on beta-testing in 2007 and 2008 that can be “plugged in” to IWR Planning Suite: the “Multi-Criteria Decision Analysis” module, and the “Annualization” module. The annualization module computes the annualized cost and outputs based on user provided implementation costs, discount rate, periodic operation and maintenance costs, period of analysis, benefits streams, ecological response rates, etc. A draft guide for the annualization tool as applied to a case-study and a draft guide for the *Multi-Criteria Decision Analysis* tool was also developed.

Regulatory Support: IWR supports the Regulatory Sub-CoP through policy analysis and training. IWR assisted HQUSACE prepare the final DoD – U.S. Environmental Protection Agency rule on “Compensatory Mitigation for Losses of Aquatic Resources” (*Federal Register*, 10 April 2008 <http://edocket.access.gpo.gov/2008/pdf/E8-6918.pdf>). After the rule was issued, IWR gave many briefings on the Mitigation Rule at many national conferences and played a major role with Corps HQ and EPA developing 1½-day mitigation regulation familiarization sessions for Corps and EPA staff and many of the presentations at the three Corps-EPA sessions in Atlanta, Seattle, and Denver.

IWR has a major role in teaching the interagency course entitled *Mitigation Banking Interagency Review Team Training*, at the National Conservation Training Center in Shepherdstown, WV, offered in June

2008. IWR helped organize the course along with the staffs of the U.S. EPA, the U.S. Fish and Wildlife Service, the Conservation Fund, and the Environmental Law Institute (ELI).

IWR continued its long-standing support managing the Regulatory Prospect courses and the Regulatory Executive Seminar, to which it added a Senior Manager's Training Seminar in August 2008.

IWR has had a major role the last several years overseeing the development of the new Corps regulatory database — ORM 2.0 — the second version of the OMBIL (Operations & Maintenance Business Information Link) Regulatory Module. By the end of FY2008, the database was deployed and historical data loaded for all districts with continual improvements being implemented.

In FY 2008, IWR became actively involved in managing the development of the Regional Internet Bank Information Transfer System (RIBITS), a compensatory mitigation bank data program. A second phase of the RIBITS contracts was awarded in late FY 2008 and legacy mitigation bank data collection begun.

Transportation Systems: The Transportation Systems Program supports HQUSACE and USACE district offices in accomplishing waterborne 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. Work completed in 2008 included updating of 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; world trade and commodity flow forecasts; distribution of updated materials and statistics from various maritime industry data subscriptions; and award of new multi-year contracts for transportation, trade and economic forecasts from Informa Economics, Inc. and IHS Global Insight. The Global Insight service includes updated barge and rail transportation modal cost models. Future work includes the development of operating costs for Great Lakes vessels, oceangoing barges, dredge plant and intermodal container transport.

Flood Damage Data: 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 2008, IWR developed flood damage functions and content-to-structure value ratios for 20 nonresidential use categories. The program provided training and technical support for IWR-GeoFIT, a geospatial floodplain inventory tool for residential, business, and public property. IWR-GeoFIT was updated to accommodate Arc-GIS 9.2. The program oversaw development of a design document and prototype for estimating flood damage to roads.

System-Wide Water Resources Research (SWWRP): System-Wide Water Resources Research (SWWRP), a joint effort between IWR, led by HEC, and ERDC laboratories, is focused on expanding research activities to the "System Wide" perspective, reflecting a concerted effort by USACE to follow concepts of sustainable development in a watershed context. Funding from SWWRP supports the development of multiple software packages that are widely used throughout the USACE and the professional engineering community, including: HEC-HMS (Hydrologic Modeling System), HEC-RAS (River Analysis System), HEC-WAT (Watershed Analysis Tool), HEC-PRM (Prescriptive Reservoir Model) and HEC-EFM (Ecosystem Functions Model). Details on all of these products are available on the HEC website <http://www.hec.usace.army.mil/>.

Flood and Coastal Storm Damage Reduction Research (FCSDR): The Flood and Coastal Storm Damage Reduction Research (FCSDR) program is a collaborative effort between ERDC and IWR, with HEC as the lead office within IWR for the program. FCSDR looks at methods to improve the analysis and development of tools relating to modeling of flood damage and flood damage reduction techniques. Funds

from FCSDR support the development of HEC-WAT (Watershed Analysis Tool), HEC-ResSIM (Reservoir Simulation Model), HEC-DSSVue (Data Storage System), HEC-SSP (Statistical Software Package), HEC-FDA (Flood Damage Analysis), HEC-FIA (Flood Impact Analysis), HEC-GeoRAS (Geospatial River Analysis System) and HEC-GeoHMS (Geospatial Hydrologic Modeling System).

Research work units pursued in 2008 included: extreme flood events, groundwater/surface water interaction and real-time forecasting. Details on all of these activities and R&D products are available on the HEC website <http://www.hec.usace.army.mil/>.

IWR-HEC H&H and Risk and Uncertainty: Funds from FCSDR support the development of the HEC-FRM (Flood Risk Management) software. This new tool is the next generation of HEC's Flood Damage Analysis (HEC-FDA) model. It includes a systems approach, event-based sampling, the ability to do scenario analysis, and structure-by-structure, cost, non-structural, loss-of-life, and agricultural damage analyses. The tool accommodates most, if not all, of the recommendations that the Corps concurred with from the National Research Council report on the Corps' implementation of risk analysis for flood damage reduction published in 2000, and it will also aid in implementing the Chief of Engineers' Actions for Change initiative.

HEC continued the modification of two Engineer Manuals, EM 1110-2-1413, "Engineering and Design – Hydrologic Analysis of Interior Areas" and EM 1110-2-1619, "Engineering and Design – Risk Based Analysis for Flood Damage Reduction Studies" via the Guidance Update Management Program (GUMP) to include materials generated from research actions. It is expected that these will be 85% complete in Q3 of FY 2009.

HEC continued to lead the project development team for the new Engineer Circular (EC) addressing levee system evaluations for the National Flood Insurance Program (NFIP). This EC will supplement and clarify existing policy, procedural and technical guidance; provide an overview of documentation requirements; outline an Independent Technical Review (ITR) process; and summarize authority and funding mechanisms.

During FY 2008, the Corps' South Pacific Division requested assistance from HEC on a study of the Sacramento River Flood Control Project (SRFCP) levees. The SRFCP is a large system of regulated and unregulated inflows, watercourses, bypasses, hydraulic structures, and tidal influences. The request relates to the determination of possible system impacts due to a non-Federal proposal for modification of a Federal project and the documentation required for compliance with the 33 USC 408 permitting process. The impact analysis requires a comprehensive approach that considers system-wide assessment of potential transfer of risk in terms of system performance. This effort provides the methods and steps to use current probabilistic analysis tools in a system-wide context to assess performance and changes to performance from modifications to project levees. This study has led to formal guidance in the use of probabilistic methods to support 33 USC 408 permit requests. This study also served as a proof-of-concept and gap analysis in the development of HEC-FRM software.

IWR-NCR Alternatives Analysis and Decision Making (AA&DM): The AA&DM in the old structure of ERDC, was a stand-alone program aimed at addressing decision making criteria, such as social impacts and economics. It evolved into a methods approach to address a growing number of concerns, including how to formulate and evaluate projects that do not have an economic basis or justification for being. Ecosystem restoration projects, the newest mission of the Corps of Engineers, falls into this category. In the AA&DM program there are several work units aimed at this objective.

The "Catalog of Management Measures" is an illustrated set of management measures which was created to better enable planners to consider a wider range of alternatives, including non-structural for ecosystem

restoration projects. The catalog has been digitized and posted on the IWR website to promote greater access. The catalog is available at <http://www.iwr.usace.army.mil/inside/products/pub/MMDL/FLD/>.

The IWR Planning Suite was initially a tool for conducting cost effectiveness and incremental cost analysis on restoration projects. It guided planners and decision makers to the alternative plans that provided the greatest amount of output for the least cost. It has grown to include plan formulation assistance as well as accommodating a tradeoff analysis tool known as Multi-Criteria Decision Making or “MCDM.” The next effort will attempt to link environmental values to the output discussions.

A continuing work unit in the program in FY 2008 is the research subject entitled “Estimating Flood Damage to Roads” caused by severe and prolonged flooding events. A model is being developed to link the expected damages to roads based on the severity of a given flood. Future efforts will link the cost of those damages in terms of time lost in travel due to damages.

A new research project initiated in FY 2008 entitled “Non-Structural Flood Damage Reduction Measures” is aimed at producing cost estimating techniques for implementing a number of defined non-structural measures. This effort is being jointly produced by IWR and the Huntington District.

Planning Methodologies:

National Economic Development Manuals: IWR is in the process of updating the National Economic Development (NED) Manuals series, originally published between 1987 and 1991. The manuals are important basic references for economists and others involved in 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. The Flood Risk Management manual is complete and available for use. The Economic Primer, the Overview NED Manual, the Coastal Storm Damage and the Deep Draft Navigation manuals are under development and are scheduled to be completed in 2009.

Update of “Digest of Water Resources Policies and Authorities” and “U.S. Army Corps of Engineers Civil Works Policy Pocket Reference”: The policies and guidance established for the Corps of Engineers are contained in a voluminous body of public law, executive orders, Engineer Regulations, Engineer Manuals, and policy memoranda. In order to make this guidance more accessible to users, the Corps of Engineers publishes Engineer Pamphlet 1165-2-1, “Digest of Water Resources Policies and Authorities” (also referred to as the “Policy Digest”). The last revision of the Policy Digest occurred in 1999.

This pamphlet is a ready reference, providing a brief summary, in digest form, of the existing administrative and legislative water resources policies and authorities pertinent to the Civil Works activities of the Corps of Engineers. In order to maintain the value of the Policy Digest as a reference tool, IWR is currently revising the Policy Digest to bring the reference up to date. The updated Policy Digest will be released as a web-based publication with hyperlinks to original policy sources.

A companion of the Policy Digest is the “U.S. Army Corps of Engineers Civil Works Policy Pocket Reference” (also referred to as the “Pocket Digest”). This ready reference was last updated in December 2005 and is also currently under revision at IWR to include policy changes. It will be released as an abbreviated hardcopy pocket edition of the larger Policy Digest.

Other Social Effects (OSE) Handbook: EC 1105-2-409, “Planning in a Collaborative Environment” reemphasizes the importance of fully considering the Other Social Effects (OSE)

and Regional Economic Development (RED) accounts in project development, evaluation and decision making. The OSE handbook provides field analysts with the framework and tools they need to perform an OSE analysis. The handbook includes a framework and principles for OSE analysis; tools for performing analyses and examples by business line. The OSE handbook is the third item produced addressing the OSE account. Previous reports on this subject include an IWR white paper entitled “Review of Guidance and Procedures for Regional Economic Development and Other Social Effects”, dated August, 2006 and a research report entitled “Theoretical Underpinnings of the OSE Account” March 2007. The OSE Handbook underwent final review in FY 2008 and is expected to be published in FY 2009.

Regional Economic Development Handbook: IWR is in the process of finalizing a handbook on Regional Economic Development (RED). The need to perform RED has grown in recent years given the renewed emphasis in EC 1105-2-409, “Planning in a Collaborative Environment” on the consideration of all four accounts (National Economic Development (NED), Environmental Quality (EQ), RED, and Other Social Effects (OSE)). This handbook will provide valuable tools and insights into the use of RED analysis. It includes discussion of RED for each of the Corps' business lines. Consideration of RED impacts in the planning process will result in more comprehensive accounting of project contributions and effects. The draft RED Handbook was reviewed internally and externally in FY 2008. It is scheduled to be published in FY 2009.

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 having multiple objectives. Since few Districts have performed true multi-objective planning, IWR is developing this manual to educate planners how to perform this more complex type of decision making. A draft version of this manual is currently under review.

NexGen Software: HEC continued to enhance many software products and introduce new products. Released in FY 2008 were:

- [HEC-HMS](#), Hydrologic Modeling System, Version 3.3. Two new simulation features were added to the HEC- HMS Version 3.2 software. They include: a new option in the SCS Unit Hydrograph transform method and simple reservoir evaporation option. In addition, as with any new release, the identification and repair of a number of bugs also took place.
- [HEC-FDA](#), Flood Damage Reduction Analysis, Version 1.2.4. This long awaited product has many new and improved features which are discussed in the “What’s New” section of the HEC-FDA web page. <http://www.hec.usace.army.mil/software/hec-fda/whatsnew.html>. HEC-FDA provides the capability to perform an integrated hydrologic engineering and economic analysis during the formulation and evaluation of flood risk management plans. HEC-FDA is designed to assist study team members in using risk analysis procedures for formulating and evaluating flood risk management measures and analyzing the economics of flood risk management projects. It computes expected annual damage (EAD) and equivalent annual damage and provides the annual exceedance probability (AEP) and conditional non-exceedance probability as required for levee certification.
- [HEC-SSP](#), Statistical Software Package, Version 1.0. This initial release of the SSP software begins to replace the multiple DOS based statistical applications that HEC has supported for years. Version 1.0 can perform flood flow frequency analysis based on Bulletin 17B, “Guidelines for Determining Flood Flow Frequency” (1982). HECC-SSP Version 1.1 will be released in FY 2009.

- [HEC-EFM](#), Ecosystem Functions Model, Version 1.0. The inaugural release of this long anticipated software is designed to help determine ecosystem responses to changes in flow regime of a river or connected wetlands. It allows the study team 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.
- [HEC-RAS](#), River Analysis Systems, Version 4.0. Additional features include water quality temperature modeling, sediment transport, gate rules and modeling of the Katrina event. The companion GIS utility package (HEC-GeoRAS) also continues to be updated and is compatible with ArcGIS 9.x versions.

More information about these software packages and other HEC software can be found on HEC's website, <http://www.hec.usace.army.mil>.

FY 2008 also saw improvements to HEC-FIA, Flood Impact Analysis, with its loss-of-life capabilities and the new Watershed Analysis Tool, [HEC-WAT](#) (which includes HMS, RAS, SSP, ResSim, EFM, GeoHMS, GeoRAS and FIA software). A beta version of the WAT was released in FY 2008 and is available for use and testing. Official releases of this software should be available in FY 2009.

HEC and ERDC continue to integrate HEC-ResSim and CE-QUAL-W2 for modeling of water-quality constraints on the operations of one or more reservoirs. HEC and the USGS, in association with IHE-Delft, are also working together to integrate HEC-RAS and the USGS MODFLOW software. These collaborative efforts will continue in FY 2009.

INTEGRATED CIVIL WORKS SYSTEMS

Performance based budgeting, performance measurement and program assessment are increasingly important. In response, IWR 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.

OMBIL: The Operations and Maintenance Business Information Link (OMBIL) Plus, a centralized performance management information system, encompasses the 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.

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 or on its annual CD-ROM.

ORM 2.0: IWR has completed development and deployment of OMBIL Regulatory Module Version 2 (ORM 2.0). ORM 2.0 is a web-based geospatial database application for tracking and managing all aspects of the Corps regulatory process. ORM 2.0 was developed using a unique combination of Corps in-house expertise and contract support. ORM 2.0 supports a consistent national business process for the regulatory program resulting in consistent tracking and reporting of program performance. ORM 2.0 integrates with USACE district enterprise geographic information systems and other federal and state agencies. ORM 2.0 provides the foundation for watershed based decision making in the Corps regulatory program. By the end of FY 2008, the database was deployed and historical data loaded for all districts with continual improvements being implemented.

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

The first version of CWMS was released in 2002. CWMS has been updated at roughly annual intervals at the thirty plus Corps offices with water control management responsibilities. Improvements to the system continue via a field-prioritized betterments program. Version 1.5 was released in FY 2007, and is the current production system.

At the end of FY 2008, version 2.0 was approaching completion, with testing scheduled for the spring of 2009 and release to the field in the summer of 2009. This version includes major revisions to the basic database structures, allowing water control users more direct access to their data and enabling them to make more effective use of the features inherent in the commercial Oracle database at the center of CWMS. A public release of the modeling component of CWMS, HEC-RTS (Real Time Simulation) will closely follow the release of CWMS 2.0.

In addition to software development, HEC has been actively engaged with ACE-IT and the CWMS management team to configure a standard hardware platform for CWMS and other water control programs. This effort will produce a more uniform and easily supported implementation of water control data and modeling systems throughout the Corps and support the uniform access to water control data nationwide through access to roll-up databases at the Corps enterprise processing centers. Information about CWMS and other HEC software is available on the HEC web site <http://www.hec.usace.army.mil>.

WATER RESOURCES TRAINING AND EDUCATION

The Institute for Water Resources, including HEC, has always been a leader in innovation within the Corps of Engineers family. IWR has been responsible for developing 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 the 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: IWR continued the USACE Proponent Sponsored Engineer Corps Training (PROSPECT) program in 2008 by presenting 24 week-long courses (fifteen led by the IWR-NCR and nine by HEC). The PROSPECT courses covered a wide range of Civil Works water resources topics: Public Involvement and Teaming in Planning; Public Involvement–Communications; Regulatory for New Regulators; Regulatory – Procedural Issues; Regulatory – Decision-Making; Regulatory Executive Seminar; Hydrologic and Hydraulic Engineering; Water Resources Planning; Ecosystem Restoration; Flood Risk Management; Collaborative Planning; and Plan Formulation. Specialty workshops often used pieces of the PROSPECT training courses but generally, the specialty workshops were built specifically for the requesting office and often included topics outside of the normal PROSPECT training. 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 consultation or whatever may be necessary.

IWR-NCR assumed responsibility for several of the Planners Core Curriculum (PCC) courses in FY 2007 and 2008. IWR staff worked with field instructors to present three of the courses as they were originally created. These included Collaborative Planning, Environmental Considerations in Planning, and Plan Formulation. Other IWR courses included Risk Analysis - Water Resources Planning; Conflict Management and Dispute Resolution taught primarily by contractors; Public Involvement - Communications, again taught by contractors; Regulatory I - New Regulators; Regulatory IIA - Procedural Issues; and Regulatory IIB - Decision Making, all of which were taught by Corps regulators from across the country. In addition to the IWR sponsored courses, IWR staff members are active members in a number of other PROSPECT courses, teaching special topics such as Cost Effectiveness and Incremental Cost Analysis (IWR-PLAN), Economics, Forecasting, Risk Analysis, and Environmental Benefits Evaluation.

In addition to the aforementioned training, IWR is also responsible for managing the Corps Planning Associates (PA) program, which is designed to be comprehensive training to build future leaders in the Planning Community of Practice. The program is a series of interrupted one, two and three week sessions interspersed with trips back to the home district to keep up with the workload. Students are committed to keeping their work at home moving while participating in the program.

IWR manages the Corps' Regulatory Executive Seminar for senior managers and works closely with Corps HQ Regulatory personnel in support of new course development.

IWR is now embarking on a new capacity development venture on an international scale through its [International Center for Integrated Water Resources Management](#) (ICIWaRM). IWR has been nominated by the U. S. Government, through the Department of the Army and the U.S. Department of State, to become a UNESCO Category II Water Center. When the UNESCO designation is approved

(expected in October 2009), it is anticipated that IWR and IWR-HEC will be called on to place even greater emphasis on water resources training and education for developing and emerging nations around the world. IWR has constructed a new classroom in the Casey Building to accommodate future classes of national and international students.

Under the auspices of the PROSPECT program, HEC conducted ecosystem oriented training courses such as “Water and the Watershed” and “Hydrologic Analysis for Ecosystem Restoration” as well as a full menu of hydrologic engineering and planning analysis topics, including courses on Flood Frequency Analysis, H&H for Dam Safety Studies, CWMS Modeling for Real-time Water Management, Steady Flow Water Surface Profile Computation using HEC-RAS, Risk Analysis for Flood Damage Reduction Projects, Unsteady Flow Analysis with HEC-RAS, and Hydrologic Modeling with HEC-HMS.

In addition to the PROSPECT program, HEC conducts many specialized training classes for a wide variety of clients.

In FY 2008, HEC staff presented two hydrologic modeling courses in Kenya and Ethiopia as part of the Combined Joint Task Force-Horn of Africa host nation agreement. As a follow-on effort, HEC in collaboration with the U.S. Geological Survey presented a two-week groundwater modeling course at the University of Addis Ababa, Ethiopia in July, 2008. The training focused on the use of groundwater models and was presented to a combined audience of graduate students, professors, and professional engineers.

Also in FY 2008 HEC staff travelled to IHE-Delft in The Netherlands where training was provided regarding water management and environmental modeling to officials from the Iraqi Ministry of Water. The course spanned a period of three weeks and targeted key water issues that were especially pertinent to Iraq. In addition, HEC worked with the USGS Idaho Water Science Center in Boise to train six engineers from the Iraqi Ministry of Water Resources in the use of HEC-DSS for data management and provided consulting regarding their telemetry system and database designs.

HEC performed additional training for the Iraq Ministry of Water Resources by providing specialized workshops in Jordan as part of a capacity development program. The capacity development program focused on the use of HEC-DSSVue and HEC-ResSim computer programs in a water resources planning study that the Ministry is undertaking.

HEC also provided training on how to evaluate environmental flows to the Mexico Institute of Water Technology.

HEC staff presented a series of seminars and workshops over a period of three weeks to the Korean Water Resources Association and Inha University. Seminar content included debris yield after wildfires and the use of HEC-HMS for sediment transport modeling. One workshop included four lectures and two hands-on example studies and was presented to nearly 200 engineers and students in the Korean water resources field.

HEC conducted or contributed to courses about sediment modeling using HEC-RAS in Omaha; advanced HEC-ResSim modeling of the Columbia River system of reservoirs in Seattle for Northwestern Division; HEC-HMS training for the California Department of Water Resources; Nonstructural Measures for Flood Risk Management course in Omaha; Unsteady Flow Analysis using HEC-RAS for Maricopa County in Phoenix, AZ; and a Planning Associates course regarding Flood Risk Management in Folsom, CA.

Planning Excellence Program: Throughout FY 2008, 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 2008 class. 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.

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.

IWR also provided support to the local delivery of selected Planning Core Curriculum courses by the Corps Major Subordinate Commands (MSCs). These seven 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: Civil Works Orientation; Planning Principles and Procedures; Environmental Considerations; Economic Analysis; H&H Considerations; Plan Formulation; and Public Involvement and Team Planning.

Advanced Degree Program in Integrated Water Resources Planning and Management: The USACE strives to provide optimum training and development opportunities in order to assure maximum efficiency of members of its workforce in the performance of their official duties. The Advanced Degree Program in Integrated Water Resources Planning and Management has been developed to ensure that the USACE maintains its standing as a leader in water resources planning and management. The program was designed to promote interdisciplinary degrees at the graduate level that were specifically geared towards water resources practitioners.

IWR has worked closely with the Universities Council on Water Resources (UCOWR) to develop a program which addresses the many challenges that the water resources planning and management community faces. Courses are offered at five universities: The University of Arizona; The University of Florida; Harvard University; Johns Hopkins University; and Southern Illinois University.

More than half of the students, either currently enrolled in the program or who have completed the program, have taken their entire program via distance learning. In particular, the University of Florida has been at the forefront of developing distance learning opportunities for participants in the program.

REIMBURSABLE TECHNICAL ASSISTANCE

Reimbursable project work was undertaken by the Institute for USACE field offices as well as: HQUSACE Civil Works Planning, Engineering, Operations, Regulatory, Office of Homeland Security; and Office of Interagency and International Activities; the Engineering Research and Development Center (ERDC), Coastal and Hydraulics and Environmental Laboratories; the Federal Emergency Management Agency; the International Joint Commission (IJC); the U.S. Agency for International Development (USAID); the National Weather Service; the U.S. Geological Survey; the Natural Resources Conservation Service; other Federal agencies; and approved Thomas Amendment Agreement technical support to the Lower Colorado River Authority, Texas and the Tampa Bay Water Authority, Florida. Other 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 damage analysis, flood warning response systems, GIS applications in hydrology and hydraulics, groundwater modeling and water supply in support of interagency investigations.

IWR worked on a variety of projects including: post-Katrina IPET support, hydraulic modeling, and risk analysis; Ft. Worth Flood Warning modeling; development of an integrated forecasting model for the National Weather Service for joint operations on the Feather and Yuba Rivers, CA; Tooele and Ft. Huachuca groundwater modeling; development of HEC-RPT software for use on the Savannah River as part of the Sustainable Rivers Project; providing additional features in HEC-RAS software for the Tampa Bay Water Authority; helping the Lower Colorado River Authority implement CWMS for their water management needs; contributing to the revision of Bulletin 17B; writing levee certification guidance; working with the Corps Screening Portfolio Risk Assessment teams evaluating the safety of the Nation's dams; assisting the Corps' Engineering Risk and Reliability Directory of Expertise with a number of Dam and Levee Safety studies and efforts; assisting the Sacramento District and the South Pacific Division perform a risk analysis of the Sacramento River from a systems context; working with the Mobile District to modernize its Alabama-Coosa-Tallapoosa (ACT) and Apalachicola-Chattahoochee-Flint (ACF) reservoir modeling applications using HEC-ResSim; working with the Detroit District to experiment with an unsteady flow HEC-RAS model for routing flows from Lake Superior to Lake St. Clair; and numerous miscellaneous consultations.

HEC entered into an agreement with the Sonoma County Water Agency and initiated another agreement with the South Florida Water Management District. Both of these agreements will allow HEC to add specific enhancements to the HEC software that provides capabilities for these agencies.

IWR staff provided reimbursable technical assistance to the Louisiana Coastal Protection and Restoration (LACPR) study team that is investigating long-term risk reduction strategies for southern Louisiana. An IWR senior economist and senior social scientist are integrated into the team and have assisted the development and execution of the risk-informed planning strategy. IWR has the lead for planning non-structural measures, including the formulation and evaluation of alternatives as well as development of the implementation strategy for these measures within the comprehensive plans.

Internationally, IWR continued to conduct work in Iraq and Afghanistan. In Iraq, HEC entered into an MOA with the U.S. Embassy Baghdad/Iraq to provide training to the Iraqi Ministry of Water Resources on the application of the Tigris-Euphrates Water Management Systems Model (WMSM). Under previous contracts with the U.S. Agency for International Development, HEC developed and delivered WMSM and documentation to the Ministry and Embassy. Due to the need for additional training of Iraqi Ministry personnel, HEC entered into another MOA for additional training.

In Afghanistan, HEC developed an operations manual and performing a water budget analysis for the Kajakai Reservoir in the Helmand Valley of Afghanistan and prepared and delivered a final report entitled “Water Balance and Regulation Alternative Analysis for Kajakai Reservoir Using HEC-ResSim” to the Afghanistan Engineer District.

HEC provided technical assistance regarding modeling tools to the IWR-led International Joint Commission Upper Great Lakes Study (UGLS). HEC provided substantial technical support to the modelers at the Detroit District and Environment Canada charged with developing the UGLS “fencepost” alternatives for Lake Superior regulation.

HEC performed a levee evaluation and performance analysis for a levee along the Anseung River protecting Camp Humphreys in South Korea. In addition to the river flooding, interior drainage issues were addressed. Nonstructural measures such as flood warning and flood preparedness were recommended as well.

CIVIL WORKS PROGRAM AND PROJECT INFORMATION

IWR maintains, develops and provides a full range of international, national and USACE project and program data and information for decision support for the Corps, 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, to be 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. 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 and analysis.

Navigation Data Center: The Navigation Data Center (NDC), located at the National Capital Region headquarters of IWR at Ft. Belvoir, VA., is the central manager of navigation, hydropower, recreation, environmental stewardship, water supply and regulatory program data for the Nation. Information provided by NDC directly supports 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), the Code of Federal Regulations, and their enforcement. 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.

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 before other nations in the development of 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.

Waterborne Commerce and Vessel Statistics: Under the authority of the River 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.

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, providing 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.

Movement data acquired by the NDC 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 movements of individual companies, are also released to private companies and to the general public.

International Trade Data System (ITDS): During FY 2008, the Institute's Navigation Data Center 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 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. The Corps is one of over 20 government agencies working with the trade and transportation community to implement this initiative.

In FY 2008, the USACE expanded the scope of a Memorandum of Agreement (MOA), initially signed in FY 2007, with the Customs and Border Protection and the Census Bureau to receive trade data from CBP and Census, and began work on a Corps-wide Memorandum of Understanding (MOU) to receive trade data from the CBP and the Census Bureau for an indefinite time period. USACE also completed its interface control document (ICD). This formal document is an agreement that specifies the technical transfer of electronic information between USACE and CBP systems.

Coastal and River Information Services (CRIS): CRIS is a public-private initiative lead by the USACE, the U.S. Coast Guard, NOAA, the IRS, and private sector representatives to establish a single method for electronic reporting and disseminating information on U.S. coastal and inland waterways. CRIS members serve on several Integrated Action Teams on the *Committee for the Marine Transportation System (CMTS)*.

The goal of this effort is to provide a framework by which domestic transportation and related information on U.S. coastal and inland waterways can be transmitted and received using one message, one set of codes, and at one time for Federal reporting purposes. The program will serve a wide range of safety, operational, security, environmental, and statistical needs.

In FY 2008, a *Federal – Industry Logistics Standardization (FILS)* sub group was formed under CRIS to address the need for standard cosign schemes for use in future processes and systems that are developed to capture, analyze, and discriminate navigation information. FILS is a joint collaboration between governmental agencies and industry to adopt a uniform nomenclature for U.S. navigational points of interest in order to improve accuracy and efficiency when sharing common information. The group jointly created and adopted a universal location code to integrate into Federal and Industry systems. Requirements for use of the code are being written into the collection regulations for USACE, IRS, the Coast Guard, and CBP. The University of Toledo completed its prototype web interface and portal for NDC. The portal was tested in FY 2008 and approved for development in FY 2009.

NDC continued its research and planning to harness Automated Identification System (AIS) data from the Coast Guard. NDC worked through the FILS subgroup to research and test ways of using the AIS data for quality control checks against other sources of navigation data.

Navigation Infrastructure Inventory: Navigation Infrastructure Inventory information supports the USACE Federal Central Collection Agency responsibility for documenting the Nation's commercial port infrastructure served by Federal channels. Data for over 9,500 individual docks is published on the Internet in summary form and as data files. 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.

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 primary user of the information in the execution of its homeland security mission. A new initiative begun in FY 2008 was the formation of the Federal - Industry Logistics Standardization group which is a working group comprised of the Corps, IRS, USCG, CBP and the barge and towing industry. The highest priority task is to produce a definitive list of dock facilities with unique identification codes and accurate geo-location that both the public and private sector can use when communicating with each other.

Lock Performance and Characteristics: The lock performance database provides the 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 and other agencies, such as the U.S. Coast Guard and the Tennessee Valley Authority (TVA), in the execution of their missions, and in the formulation of the USACE budget. A successful pilot project at several New Orleans lock sites demonstrated the ease of using the Coast Guard required vessel Automated Information System (AIS) signal to increase lock operator situational awareness by visualizing on a map the location and identification information of all vessels in the vicinity of the lock. This enables the lock operator to better plan the locking procedure. The capture of the AIS signal also will allow selected timing events to be automatically entered into the database. Investigations are underway to implement this capability nationwide.

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 public web site, <http://www.ndc.iwr.usace.army.mil>. The lock 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. Data is used to generate 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. 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. The data are used in determining the charge rate of the Silent Inspector system.

Recreation: Recreation data for the Corps' 4300 recreation areas are collected and maintained within the OMBIL database. Recreation inventory (recreation areas, visitor centers, facilities, and amenities), outputs (e.g. visitors, visitor hours) and activities (e.g. citations and interpretive contacts) are combined with revenues and expenditures to produce performance measures that assist the Corps in making management decisions for the Recreation program. This data is furnished to public websites such as [Value to the Nation](#), [CorpsLakes](#), and the federal interagency recreation website, www.recreation.gov. In FY 2008, OMBIL has focused on improving the accuracy of the visitation data and the inventory of recreation projects. 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 ERDC.

IWR, in collaboration with ERDC, has provided additional technical support to Corps Recreation Business line activities. The activities that were accomplished in FY 2008 include: continuing to support the Performance Based Budget Development for Recreation Business line; Regional Economic Impact Analysis of Recreation; GIS Application and the implementation of Google Earth application for all Corps Recreation projects; and other miscellaneous technical support to Corps Natural Resources management activities.

IWR provided technical support for individual public survey submissions on recreation planning and recreation management.

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 determine its performance, make budgeting decisions and furnish OMB with program performance information. In FY 2008, all five hydropower performance measures for the FY 2010 budget process were supplied by OMBIL hydropower data. Also added to OMBIL Plus was a module related to capturing the ongoing water supply reallocation studies.

Water Supply: IWR 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 for that portion of the USACE Water Supply budget is developed in coordination with the MSCs and the strategic plan as presented in the Program Assessment Rating Tool. It is necessary to develop annual budget guidance to the MSCs, collect their data, prioritize it in conjunction with the seven other business lines and eight program areas, 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 OMB. The annual program must then be modified and adjusted as necessary based on OMB comments and directives.

IWR is responsible for the development and maintenance of the USACE database of Water Supply projects. This database was originally developed in 1996, updated in 2004 and again in 2005. In 2006 an effort was undertaken to develop a Water Supply module in OMBIL and this effort is still underway. This process, once loaded into the Water Supply module of OMBIL, will enable a continual update of the OMBIL data, similar to other business lines. There was no 2006 database due to the effort required to load OMBIL. For both the 2007 and 2008 databases staff is using a combination of the new OMBIL data, where loaded and the old 2005 data from those districts which have not completed the loading process. The 2008 database shows there are 134 Corps multipurpose projects which contain storage space for municipal and industrial water supply. These projects are located in 26 states, Puerto Rico and in 24 of the 38 Corps districts. In these projects the Corps has 338 repayment agreements representing some 9.28 million acre-feet of storage space and an investment cost of \$1.3 billion. The storage space is capable of providing some 5 billion

gallons of water per day for use by municipalities and industries which have signed repayment agreements. All monies collected by the repayment agreements are deposited into the Treasury of the United States.

Optimization Tools for Navigation (OTN): The optimization tools for navigation program supports multiple initiatives concerning methods and analyses to minimize costs or enhance efficiencies for asset management of the Corps' waterborne navigation operation and maintenance (O&M) program. Related initiatives include support for development of the *Channel Analysis Design Evaluation Tool (CADET)* in partnership with ERDC as technical scoping and review lead and NAVSEA-Carderock as prime technical developer; 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"); research and investigation to better quantify critical inputs for navigation analysis conducted with assistance of the U.S. Naval Academy; and support to the USACE Marine Design Center (USACE-MDC).

INTERNATIONAL WATER RESOURCES

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:

Lake Ontario and St. Lawrence River Study: The *International Lake Ontario-St. Lawrence River Study* was conducted and completed by IWR for the International Joint Commission (IJC) in May 2006. A [final report](#) was submitted to the Commission, recommending three alternative plans for their consideration. The purpose of the study was to assess and evaluate the Commission's *Order of Approval*, developed in the late 1950's and used to regulate outflows from Lake Ontario through the St. Lawrence River. During the course of the 50 years of regulation, there were many discretionary changes by the outflow managers to deal with extreme hydrologic conditions and emerging interests such as environmental concerns and recreational boating. The five-year, \$20 million study developed numerous options and recommended three candidate plans after evaluating the impacts of changing water levels on shoreline communities, domestic and industrial water users, commercial navigation, hydropower production, the environment and recreational boating, along with forecasted effects of climate change. The study was conducted in full partnership with Canada, utilizing a transparent planning process pioneered by IWR and known as Shared Vision Planning (SVP). The open citizen and public participation process was guided by a volunteer *Public Interest Advisory Group* appointed by the IJC, while the study team of approximately 150 scientists and engineers was composed of a broad assembly of multi-disciplinary technical experts on nine technical working groups and led by co-directors from Canada and the U.S. The U.S. co-director was Dr. Eugene Stakhiv and U.S. co-Manager was Dr. Anthony Eberhardt both of IWR.

IWR staff provided input throughout 2008 on refining the candidate plans based on agency review and consultation. The IJC continues to explore options for refining procedures for Lake Ontario outflow regulation and is presently considering using the framework of the existing plan, Plan 1958-D, but adapting improvements identified during the Study operationally to achieve increased benefits to all interests.

International Upper Great Lakes Study: As the *Lake Ontario - St. Lawrence River Study* ended, USACE IWR entered into a new MOA with the International Joint Commission for initiation of a new 5-year, \$15 million US-Canadian study focusing on the *Lake Superior Regulation Plan* and the potential erosion problems associated with the St. Clair River channel (thought to cause the long-term lowering of Lake Michigan/Lake Huron levels). Drs. Eugene Stakhiv and Anthony Eberhardt were appointed as U.S. co-Director and co-Manager and IWR was again selected to lead the U.S. contributions to the study, emphasizing the success of the *Shared Vision Planning* approach in the just concluded *Lake Ontario – St. Lawrence River study*.

IWR initiated activities related to investigating whether the current Lake Superior outflow management procedures could be improved, considering evolving Upper Great Lakes interests and climate change, and investigating St. Clair River flow characteristics, determining how the natural regime of the river has been changed by human activities. Investigations are being conducted by two task teams: the Lake Huron Outflow/St. Clair River Conveyance Task Team to investigate through hydrologic, hydraulic and sediment transport modeling the factors that may be responsible for declining levels (Phase 1) and the Lake Superior Regulation Task Team to investigate improved outflow management plans (Phase 2). Dr. Eberhardt is U.S. co-lead of the Lake Superior Task Team.

During 2008, extensive investigations took place and information was gathered in an effort to determine the causes of declining upper Great Lakes levels. Activities were centered around hydraulic modeling and analyses of data, St. Clair River sediment studies and studies of Great Lakes hydro-climatology. These

studies were conducted by various elements of the Corps including the Great Lakes and Ohio River Division, the Detroit District, IWR-HEC and ERDC's the Cold Regions Research and Engineering Laboratory, by offices of the USGS and NOAA, along with a number of universities, and with comparable federal and academic participation in Canada. All of these investigations were subject to independent peer review by experts selected through ASCE-EWRI and the Canadian Water Resources Association. Initial findings suggest that the declining upper Great Lakes levels are due to both man-made and natural activities which have resulted in increased conveyance of the St. Clair River, hydrologic factors occurring in recent decades and longer term glacial isostatic adjustments. Uncertainty surrounding each of these factors prevents a definitive determination of individual contributions. The findings of these investigations will be included in the Phase 1 Report, the first draft of which will be completed in May 2009. An extensive communication strategy including fourteen public meetings around the Great Lakes will take place following its release.

During 2008, all of the technical work groups which will perform investigations of coastal processes, hydropower, commercial navigation, recreational boating, municipal and industrial water uses and the ecosystem for Phase 2 of the Study were established. They will concentrate during 2009 on defining performance indicators to be used within the Study's shared vision model to evaluate alternatives to the Lake Superior regulation plan, 1977-A, which has been in use since the early 1990s.

World Water Council: 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 financial institutions as its founding organizations. The main activity of the WWC is hosting the World Water Forum, which is held once 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. The *5th World Water Forum* (WWF) will be held 16-22 March 2009 in Istanbul, Turkey, with the theme "Bridging Divides for Water."

Mr. Steven L. Stockton, HQUSACE Director of Civil Works, was elected to the WWC Board of Governors in 2006 and continued to serve on the board through 2008 and into 2009. Dr. Jerry Delli Priscoli (IWR) serves as the alternate and is a representative on the WWC Executive Bureau. Ongoing WWC activities involve close liaison with the U.S. Department of State, 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.

USACE and IWR will continue to take an active role in international water related research and policy issues through the [*International Center for Integrated Water Resources Management*](#) (ICIWaRM), along with the [*World Association for Waterborne Transport Infrastructure*](#) (PIANC), formerly known as the International Navigation Association.

Perhaps the most visible 2008 international activity in this regard was USACE participation in the *United Nations High Level Expert Panel on Water and Disasters*, chaired by the Prime Minister of South Korea, Han Seung-soo Han. The panel was originally convened in 2007 by the U.N. Secretary General's *Advisory Board on Water and Sanitation* in response to the unprecedented climate-related disturbances such as droughts, hurricanes, floods and tsunamis over the last decade, ranging from Hurricane Katrina in the U.S., to Australia's 1,000 year drought. In 2008 alone, 321 disasters killed 235,816 people, affected 211 million others and cost the world economies over US\$ 181 billion. USACE Commander and Chief of Engineers Lieutenant General Robert L. Van Antwerp represented USACE on the *High Level Expert Panel*, along with the participation of Mr. Steven L. Stockton, HQUSACE Director of Civil Works, and Dr. Jerry Delli Priscoli of IWR. The USACE hosted the *High Level Expert Panel's* fourth meeting, held

in New Orleans, LA, in October, 2008. The *High Level Expert Panel* will present its findings and action agenda at the *5th World Water Forum* in Istanbul, Turkey, in March 2009.

During FY 2008, Dr. Delli Priscoli continued to serve as Editor-in-Chief for *Water Policy*, an internationally acclaimed peer-reviewed international journal that is published six times per year.

Fifth World Water Forum: IWR's ongoing engagement with the World Water Council (WWC) reached a new threshold in FY 2008 through numerous contributions to the 5th World Water Forum (WWF5), scheduled for 16-22 March 2009 in Istanbul Turkey. IWR was actively involved in the extensive WWF5 Thematic, Regional and Political preparatory processes, which began in 2007 and resulted in the definition of six themes and twenty-four topics under the overarching Forum theme "Bridging Divides for Water". Mr. Lindy Wolner, detailed in March 2008 from HQUSACE, Office of Interagency and International Services, served as resident IWR liaison for a one-year assignment at the Secretariat for WWF5, located within the General Directorate State Hydraulic Works (DSI) in Istanbul. A key part of the liaison assignment was to identify and promote U.S. Government agency and stakeholders engagement in the WWF5 preparatory process, providing a linkage between the WWF5 Secretariat, WWC, USACE and a broad range of international and interagency water institutions and organizations, including the U.S. Department of State, other U.S. agencies, NGO's, the private sector, and various international partners.

IWR's commitment and support of successive WWF's is another means of applying the USACE's extensive institutional expertise to the issues raised in government reports including the [Senator Paul Simon Water for the Poor Act, 2008 Report to Congress](#), prepared by the U.S. Department of State, and the USAID report entitled [Addressing Water Challenges in the Developing World - A Framework for Action](#). The USAID report identifies three key challenges that must be addressed to achieve a water secure world. These include, improving water resources management among competing needs; improving access to water supply and sanitation, and promoting better hygiene; and improving water productivity in agriculture and industry.

These activities and subsequent efforts by IWR will contribute to the successful implementation of WWF5 outcomes, strengthen and expand interagency and international partnerships, and help to achieve U.S. government goals for international water resources.

UNESCO Partnerships: A large number of UNESCO-related activities are sanctioned by the U.S. Government (USG), in particular those related to the U.S. National UNESCO Commission and the U.S. International Hydrological Programme (IHP) Committee.

In 2006, Mr. Robert A. Pietrowsky, Director of IWR, was selected to be one of six permanent Federal agency members of the newly established U.S. National IHP Committee, and he has been part of the USG delegations to UNESCO at the IHP Intergovernmental Council (IGC) Meetings in 2004, 2006 and 2008.

In support of these activities, USACE has five MOUs with IHP and its UNESCO water centers: an umbrella agreement with [IHP](#); a second MOU with UNESCO-[IHE](#) (Institute for Water Education, Delft, the Netherlands); and newer MOU agreements with [ICHARM](#) (International Center for Water Hazard and Risk Management) in Tsukuba, Japan (signed July 3, 2006); [CAZALAC](#) (Centre for Arid and Semi-arid Zones of Latin America and the Caribbean) in Chile (signed July 3, 2006); and [CATHALAC](#) (Water Center for Humid Tropics of Latin America and the Caribbean) in Panama (signed August 22, 2007).

IWR manages these agreements and is also engaged through an MOU with the Global Water Partnership (GWP) and its efforts to implement integrated water resources management in developing countries. GWP is an international NGO with the financial support of the European Union and the World Bank. IWR has been working with select members of GWP Technical Working groups to develop IWRM protocols.

During 2008, a key set of activities involved moving forward USACE IWR's International Center for Integrated Water Resources Management (ICIWaRM) toward an eventual designation by UNESCO as a Category II Centre (<http://www.iwr.usace.army.mil/iciwarm/>). The center had been selected as the U.S. Government nominee for consideration as a UNESCO center in February 2008 after a national-level competition. With the support of the U.S. National UNESCO Commission and the U.S. National Committee for UNESCO's International Hydrological Programme (IHP), the U.S. Permanent Representative to UNESCO and the Assistant Secretary of the Army for Civil Works, ICIWaRM's nomination was submitted to UNESCO Headquarters, and subsequently approved by the IHP Bureau in March 2008. Ultimately, the center was endorsed by the IHP 36-member nation Intergovernmental Council (IGC) in June 2008 at its bi-annual meeting at the UNESCO Headquarters in Paris, France. IWR Director Robert A. Pietrowsky and Dr. Eugene Z. Stakhiv were part of the official USG delegation attending the IGC meeting. During the IGC meeting, Dr. Stakhiv was also re-elected to a four-year term to the Advisory Board for UNESCO's International Centre for Water Hazard and Risk Management (ICHARM) in Tsukuba, Japan.

ICIWaRM has made substantial progress while its formal designation as a Category II Centre by UNESCO was pending, including the continued involvement of Dr. Jason Giovannettone, an IWR-NRC Fellow, on the development of a *Drought Atlas for South America* in partnership with the Water Center for Arid and Semi-Arid Zones in Latin America and the Caribbean (CAZALAC)—another UNESCO Category II Water Centre. This project was inspired by the IWR's *National Drought Atlas of the U.S.*—a unique source of information about the frequency, severity and duration of drought as reflected by precipitation depths and streamflows.

Multiple IWR senior scientists, including IWR Director Mr. Robert Pietrowsky, Dr. Paul Bourget, Dr. Gerry Galloway, and National Flood Risk Management Program Director Mr. Pete Rabbon, participated in the [4th International Symposium on Flood Defence](#) held in Toronto, Canada, which was jointly sponsored in North America by Canada's Institute for Catastrophic Risk Reduction, and USACE IWR/ICIWaRM.

Support for UNESCO's Hydrology, Environment, Life and Policy (HELP) program was continued in partnership with one of ICIWaRM's core partners - the National Science Foundation's Science and Technology Center for Sustainability of Semi-Arid Hydrology and Riparian Areas (SAHARA) at The University of Arizona. ICIWaRM co-sponsored a HELP workshop for the Western Hemisphere, hosted at SAHARA in November 2008.

Another high visibility international water resources activity in support of the Mekong River Commission (MRC) was carried out in collaboration between IWR/ICIWaRM, HQUSACE, USACE Northwestern Division, Portland District, and other key U.S. agencies such as the Bonneville Power Authority (BPA). This involved a technical exchange and a study tour to the Columbia River Basin by fifteen senior officials of the Mekong River Commission (MRC) led by Dr. Jerry Delli Priscoli of IWR. The MRC chose the basin because it and the Mekong share some similar natural characteristics and because several decades ago the Columbia faced similar development and management decisions as many of the Mekong Basin countries face now. In addition, the Columbia River Basin demonstrates innovative approaches in basin management and public participation.

IWR provided extensive support to the [World Water Assessment Programme](#) (WWAP) in 2008, and in particular on its preparation of the third World Water Development Report which is scheduled to be released during the 5th World Water Forum in Istanbul, Turkey, in March 2009. IWR staff and fellows contributed in the areas of indicators, water policy, waterway transport and climate change adaptation.

Upon his re-appointment to the ICHARM Advisory Board in June 2008, Dr. Eugene Stakhiv was subsequently elected as board chairman, while also serving as co-chair of the joint UNESCO-IHP and

Network of Asian River Basin Organizations (NARBO) sponsored initiative to develop IWRM Guidelines at the river basin level. IWR Director, Mr. Robert Pietrowsky, continued his service as a member of the Governing Board of [UNESCO-IHE](#) in Delft, the Netherlands. He also co-presented a paper entitled *Putting UNESCO Centers to Work: Implementing the IHP-VII Program in Developing Nations* at UNESCO's International Conference on *Water Scarcity, Global Changes, and Groundwater Management Response*, December 2008 at Irvine, CA.

At the close of 2008, Dr. Will Logan of USACE IWR/ICIWaRM was selected to serve at the U.S. Mission to UNESCO in Paris as the U.S. Science Attaché in 2009.

Dutch Rijkswaterstaat: The Corps signed an [MOA](#) with the Dutch Rijkswaterstaat (RWS) in May 2004 as a means to more effectively exchange information and resources. The RWS has a mission quite similar to that of the USACE and much collaboration has transpired regarding flood and coastal zone management, urban protection, flood risk and safety measures and general water resources policies that highlight the similarities and differences between our respective countries.

There were several exchanges that transpired during 2008. A senior-level Dutch delegation visited West Palm Beach, FL and New Orleans, LA to discuss and visit projects related to environmental restoration, emergency management and urban/coastal recovery efforts. In conjunction with that delegation, Florida Earth, a non-governmental organization, led a delegation to the Netherlands to discuss the possibility of establishing an MOA between Florida and the Dutch Government. Representatives from IWR and the Jacksonville District accompanied this delegation, which did not produce a new separate agreement. The Deputy Director of RWS visited Washington, DC to discuss interest in the formation of an MOA steering committee with Corps Headquarters representatives and ASA-CW. The Netherlands Water Partnership hosted a workshop in the Netherlands on levee safety and standards that was attended by Corps representatives. In conjunction with that workshop, a flood risk management team was formed under the MOA to share information through joint papers and meetings. Further discussions were held in conjunction with the Fourth International Symposium on Flood Defence (ISFD) which took place in Toronto, Canada. The first draft of a planned book comparing the development of water management practices between the Dutch and U.S. was produced, and is undergoing review for publication in early 2010.

Workshops between the two organizations on matters related to floodplain and coastal zone management continued in FY 2008. Plans are underway to devise a more strategic approach to the agreement to allow for broader USACE engagement beyond the more localized efforts to date. The Dutch have developed unique approaches to a broad range of water management areas, such as levee and sea wall integrity, operations and maintenance, soft soil technology, dredging techniques and risk assessment methodologies. The joint activities flowing from the MOA continued to gain momentum during this reporting period.

Japanese Ministry of Land, Infrastructure, Transport: USACE participates in an ongoing technical exchange program with 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 5-year term on 26 February 2008. The IA names the Chief of Hydrology and Hydraulics at the St. Louis District as the Technical Program Officer, responsible for the technical exchange on the USACE side and names the Director of Civil Works as the oversight authority for the exchange. The national project management oversight authority has been delegated to IWR and within the Institute to HEC. To date, the exchange 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 River Bureau.

Under the auspices of the agreement with the MLIT, Mr. Christopher Dunn, Director of HEC, and Mr. Tom Evans Chief of the HEC Water Management Systems Division, travelled to Japan during February 2008 to participate in the USACE and MLIT 4th Conference on Flood Control and Water Resources Management. Topics discussed at the conference included climate change, risk management, natural environment and preservation, and river information systems. Corps representatives gave presentations on the Corps Levee Program and on the Corps Risk Analysis Program.

In addition to the water resources technical exchange program, a key objective of the visit was the signing of a 5-year extension of the USACE-MLIT partnering agreement.

The Office of the Secretary of Defense approved the extension to the agreement on 20 February 2008 and Mr. Lloyd Pike, Chief of the HQUSACE Pacific Ocean Division Regional Integration Team led the U.S. delegation on behalf of Mr. John P. Woodley, ASA (CW). IWR was represented in the delegation by Mr. Christopher Dunn, Director of HEC, and Mr. Tom Evans, Chief of the HEC Water Management Systems Division, who also serves as the Corps team leader for the execution of the USACE-MLIT partnership.

In January 2008, HEC hosted Mr. Makoto Kutsukake, Deputy Director of the Water Administration Division in MLIT's River Bureau. Mr. Kutsukake visited the United States under the auspices of a five month residency technical exchange with HQUSACE and IWR. Mr. Kutsukake was awarded a grant by the government of Japan to study abroad and elected to visit USACE, FEMA, and other agencies to focus on "New measures to prevent flood disasters, based on the appropriate mutual relation among construction of levees and dams, flood insurance and land use restriction in flood-prone areas taking Hurricane Katrina into consideration." During his visit to HEC, Mr. Kutsukake gave a presentation on Japanese River Administration and Flood Management to the Intergovernmental Flood Risk Management Committee, comprised of the leadership from FEMA, USACE, the Association of State Floodplain Managers, and the National Association of Flood and Stormwater Management Agencies.

International Technical Reimbursable Projects: FY 2008 continued to yield major growth in technical assistance projects undertaken in cooperation with USACE, Federal and non-Federal organizations.

In FY 2008, HEC provided training and technology transfer support to engineers in Iraq's Ministry of Water Resources (MoWR) at the request of the U.S. State Department's Iraq Transition Assistance Office (ITAO). HEC provided face-to-face training in three two-week sessions in Jordan and Turkey, spaced roughly two months apart and concluding in May 2008. Topics covered in the training included Reservoir Systems Modeling with HEC-ResSim, the application of HEC-ResSim in a model of the Tigris-Euphrates Water Management System, the use of HEC's DSS database for storage and access to hydrologic data, the use of the HEC-DssVue program as an interface to data stored in DSS, and the use of the Jython programming language for developing customized applications of ResSim and DssVue. In addition, HEC staff provided remote support to MoWR via telephone and email to keep the tech-transfer process moving forward between the training sessions. A report on the project was submitted to ITAO at its conclusion in June 2008.

In conjunction with the Combined Joint Task Force – Horn of Africa (CJTF-HOA) and Naval Facilities (NAVFAC), four professionals from Ethiopia came to HEC to receive surface water modeling training. Data from a basin in Ethiopia was used in the workshop portion of the training. This training was a “train-the-trainer” type exercise. The goal is for the workshop attendees to take home what they learned and show others in Ethiopia how to do surface water modeling. As a result of this training, HEC tools are now being used in classes at the University of Addis Ababa.

Also in FY 2008, HEC teamed with the USGS to provide groundwater modeling training in Ethiopia in conjunction with the Geologic Survey of Ethiopia. The training was held at the University of Addis Ababa and included both students and government personnel.

HEC staff contributed to a course on Integrated Water Resources Management (IWRM) that was organized and hosted by UNESCO-IHE, Delft, the Netherlands. The course was a collaborative activity between UNESCO-IHE and IWR and was designed for engineers from the Iraq Ministry of Water Resources.

HEC provided surface water modeling training in Kenya. This training was held at the University of Nairobi and included both students and Kenya Ministry of Water and Irrigation employees.

HEC was contracted by CJTF-HOA, through NAVFAC, to build a rainfall-runoff model for the Ogaden Basin in Ethiopia. This model will be given to the Ethiopians and used as a sample for model building. Additionally, it will be used in a two week training class scheduled for Ethiopia in May 2009.

HEC is working in conjunction with the USGS on combining the HEC-RAS software with the USGS's ModFlow software. It has been decided to use a method developed in Europe, OpenMI, to facilitate this combination. In order to move forward, work has commenced in association with the Deltares Institute in the Netherlands. Deltares has experts that HEC has contracted with to help with the software combination. The agencies have had two productive week long meetings at HEC and additional collaboration is scheduled in the future.

WORLD ASSOCIATION FOR WATERBORNE TRANSPORT INFRASTRUCTURE (PIANC)

The World Association for Waterborne Transport Infrastructure (PIANC), formerly known as the International Navigation Association, is an organization with twenty-two national sections and membership in 65 countries, including 31 qualifying members, two international river commissions, about 450 corporate members (private companies, harbor agencies, firms, laboratories, universities, etc.) and about 2,000 individual members. From its headquarters in Brussels, Belgium, it acts as a clearinghouse of technology and experiences relating to ocean and inland navigation improvements which are exchanged among engineers, scientists, port operators, and marina and vessel owners, to name a few. Its objective is to advance, on a worldwide basis, the sustainable development of all kinds of navigation through the exchange of technical information on port and waterway development. The objective of the Association is met by holding International Congresses and by publishing technical bulletins and special reports. Special reports are published describing the results of the work of international research teams, or working groups, composed of those national members interested in the particular subject under study. The organization also serves as an excellent source of identifying individual and corporate expertise throughout the world on PIANC-related subjects.

The United States, a member of PIANC since 1902, provides an annual appropriation for the support and maintenance of the organization. This includes an annual subvention to PIANC and payment of a portion of the travel expenses of officially appointed U.S. delegates (Commissioners) to meetings of the Annual General Assembly and Congresses. The annual appropriation for the U.S. Section PIANC is currently \$45,000, including the annual subvention of approximately \$15,000. The U.S. Section is administered by law under the auspices of the USACE. It is located at the IWR NCR Humphreys Engineer Center facility. The U.S. Section is composed of dues-paying individual and corporate members. U.S. Section membership on September 30, 2008 totaled 215, consisting of 187 individual members and 28 corporate members.

United States National Commission: The United States National Commission constitutes the governing body of the U.S. Section. In 2008 the ex-officio officers of the U.S. National Commission were: Chairman, John P. Woodley, Jr., Assistant Secretary of the Army (Civil Works); President, MG Don T. Riley, Deputy Commanding General; Secretary, Ms. Anne Cann, an employee of IWR.

In 2008, U. S. National Commissioners were: Mr. Shiv Batra, Vice President representing the Western Region and President, INCA Engineers, Inc.; Mr. James McCarville, Vice President representing the Eastern Region and Executive Director of the Port of Pittsburgh Commission; Dr. Robert Engler, Vice President representing the Central Region and Senior Environmental Scientist, Moffatt and Nichol; Dr. Robert H. Randall, Texas A&M University; Mr. John Headland, Senior Vice President and Regional Manager, Moffatt and Nichol; Mr. Dave Sanford, Director of Navigation Policy and Legislation, American Association of Port Authorities; Dr. Craig E. Philip, President and CEO, Ingram Barge Company; and Mr. Dominic Izzo, Project Director, KBR.

PIANC Activities: In July of 2008, the US Section of PIANC held its Annual Membership Meeting in Alexandria, VA, at the Institute for Water Resources. More than seventy PIANC USA members participated in the full day meeting which included technical presentations including “Climate Change and Navigation” and “Developments in the Automation and Remote Operation of Locks and Bridges”. The 2008 PIANC USA winner of the DePaepe-Willems Paper Competition presented his winning paper on “Subsurface 3D Modeling: An Application to Waterfront Project Planning and Site Evaluation.” A networking dinner was held that evening, including a PIANC Young Professionals meeting.

In May of 2008, the PIANC International Annual General Assembly (AGA) was held in Beijing, China. Members of the U.S. delegation included Mr. John P. Woodley, Jr., MG Don T. Riley, Ms. Anne Cann, Mr. Shiv Batra, Dr. Robert Engler, Mr. James McCarville, Dr. Craig E. Philip, Mr. John Headland, Mr. E. R.

Heiberg, LTG (ret.), and Mr. Harry Cook. Two technical papers, prepared by members of the staff of IWR, were presented at the International Navigation Seminar following the AGA. Mr. David Grier presented a paper entitled “*U.S. Harbor Improvements: Are They Critical to Trade with China?*”, and Mr. John P. Woodley, Jr. and Ms. Anne Cann coauthored and presented “*Balancing Inland Navigation with Flood Control and Environmental Needs in the United States.*”

As part of the U.S. Section’s Latin American outreach activities, Ms. Lillian Almodovar and Mr. David Grier, USACE IWR, participated in the Third Hemispheric Conference on Port Security, organized by the Organization of American States, Inter-American Committee on Ports (OAS-CIP), held in Punta Cana, Dominican Republic in April, 2008. Mr. Grier also attended the Caribbean Shipping Association (CSA) Annual Meeting held in Trinidad in October, 2008. At the meeting the CSA signed an MOU with OAS-CIP Executive Secretary Carlos Gallegos. The U.S. Section PIANC signed an MOU with OAS-CIP in 2005.

The U.S. Section produces a quarterly newsletter, *PIANC Bulletin*, containing U.S. Section information and industry news. (<<http://www.pianc.iwr.usace.army.mil/nenewsletter.cfm>>). Edmond J. Russo, Jr., U.S. Army Corps of Engineers, ERDC, is the editor of the PIANC Bulletin.

In recognition of its outstanding contributions both within the U.S. and around the globe, the U.S. Section of PIANC received the 2008 Award as the PIANC’s Outstanding Section worldwide.

PIANC Executive Committee (ExCom): PIANC International’s Executive Committee ensures the executive management of the Association and monitors the decisions and directives of the AGA and the Council. The U.S. representative on the ExCom is Mr. Shiv Batra, President, INCA Engineers, Inc. (Vice President of Western Hemisphere).

Representatives to Committees and Commissions: The principal business of PIANC is the sponsorship of technical working groups. The U.S. Section is represented by Principal and Co-Principal Members of the Commissions managing technical working group activities. The U.S. representatives were:

Environmental Commission — Dr. Susan Rees, U.S. Army Corps of Engineers, Mobile District; Dr. Todd Bridges, U.S. Army Corps of Engineers, ERDC

Inland Navigation Commission — Mr. John Clarkson, U.S. Army Corps of Engineers, Huntington District; Mr. William Ronald Coles, WR Coles and Associates

Maritime Navigation Commission — Mr. E. Dan Allen, Moffatt and Nichol

Recreational Navigation Commission — Mr. Bob Nathan, Moffatt and Nichol; Mr. Jack C. Cox, HDR

International Cooperation Commission – Mr. John Headland, Moffatt and Nichol; Bengt Bostrom, Consultant

Promotion Commission – Dr. Thomas Wakeman, Stevens Institute of Technology

Young Professionals Commission – Ms. Jessica McIntyre, Moffatt and Nichol

New Technical Working Groups: In 2008, eleven new Working Groups were formed. The groups are listed below along with the name of the U.S. Representatives.

InCom 127 (Fish Passage) – Mark Cornish, John Plump, and YP Aaron Buesing

InCom 128 (Alternate Bank Protection Methods for Inland Waterways) – S. Kyle McKay

InCom 129 (Waterway Infrastructure Asset Maintenance Management) - José E. Sánchez and James R. Fisher

MarCom 135 (Design Principles for Container Terminals in Small and Medium Ports) - Dimitris Pachakis, Laurence Emsley and Steven Gray

RecCom 130 (Anti-sedimentation Systems for Marinas and Yacht Harbors) - Richard Dornhelm

RecCom 131 (Catalogue of Marina Construction Elements) – no U.S. representative

RecCom 132 (Dry Stack Storage) – Tonu Mets
RecCom 133 (Economic Aspects of Recreational Navigation) – Michael Herrman
RecCom 134 (Design and Operational Guidelines for Superyacht facilities) – Mark Pirrello
EnviCom 136 (Recommendations for Sustainable Maritime Navigation) – David Moore
CoCom 126 (Training in Ports and Waterways) – Dr. Billy Edge

Working Group Reports Published in 2008: In 2008, eight Working Group Reports were published. The Reports are listed below along with the name of the U.S. Representatives. PIANC changed the Working Group/Report numbering system in 2008.

InCom 99 (old #27) (Guidelines for Environmental Impacts of Vessels) — Dr. Thomas Keevin and Stephen Maynard
InCom 96 (old #28) (Developments in Automation and the Remote Control of River Works) — Ashok Kumar
MarCom 103 (old #42) (Life Cycle Management of Port Structures – Recommended Practice for Implementation) — Ron Heffron and Valery M. Buslov
MarCom 102 (old #43) (Minimizing Harbor Siltation) — John Headland and William McAnally
RecCom 98 (old #16) (Protecting Water Quality in Marinas) — Jack Cox
EnviCom 100 (old #13) (Environmental Benefits of Waterborne Transport) — Dr. Douglas Clarke and Thomas Wang
EnviCom 104 (old #14) (Dredged Material Beneficial Use Options and Constraints) — Richard Gorini and Jack Word
CoCom 97 (old #1) (CoCom 1-IAPH Joint Working Group on Small Island Ports) – Bengt Bostrom

2008 Active Working Groups and the names of the U. S. Representatives:

InCom 29 (Innovations in Navigation Lock Design) — Dale Miller and YP Michael Tarpey
InCom 30 (Inventory of Inspection and Repair Techniques of Navigation Structures) — Robert Willis, Ron Heffron, and YP Chad Linna
InCom 31 (Organization and Management of River Ports) — Jim McCarville
InCom 32 (Performance Indicators for Inland Waterways Transport) — William Harder
InCom 127 (Fish Passage) – Mark Cornish, John Plump, and YP Aaron Buesing
InCom 128 (Alternate Bank Protection Methods for Inland Waterways) – S. Kyle McKay
InCom 129 (Waterway Infrastructure Asset Maintenance Management) - José E. Sánchez and James R. Fisher
InCom Permanent RIS WG (River Information Services) – Richard Lockwood and Jeff Fritz
MarCom 39 (Monitoring of Breakwaters) — James D. Prehn
MarCom 46 (Maritime Freight Transshipment) - Doris Bautch
MarCom 47 (Criteria for the Selection of Breakwater Types and their Optimum Damage Risk Level) — Dr. Jeffrey A. Melby
MarCom 48 (Guidelines for Port Constructions, Related to Bowthrusters) — Marcel Hermans and Gary Greene
MarCom 49 (Horizontal and Vertical Dimensions of Fairways) — Michael J. Briggs
MarCom 50 (General Principles for the Design of Maritime Structures) — Bill Papparis
MarCom 51 (Water Injection Dredging) — Timothy L. Welp
MarCom 52 (Criteria for the (Un-)Loading of Container Ships) — Dan Allen
MarCom 53 (Design and Construction of Maritime Structures in Tsunami Prone Areas) — John R. Headland and Michael J. Briggs
MarCom 54 (Use of Hydro/Meteo Information to Optimize Safe Port Access) — Robert Weeks and Majid Yavary

MarCom 55 (Safety Aspects of Berthing Operations of Oil and Gas Tankers) — Larry Cunningham, Sarah Rollings, and YP Larry Wise

MarCom 56 (Application of Geotextiles in Waterfront Protection) — Doug Gaffney

MarCom 57 (Stability of Pattern Placed Revetment Elements) — Margaret Boshek

MarCom 135 (Design Principles for Container Terminals in Small and Medium Ports) - Dimitris Pachakis, Laurence Emsley and Steven Gray

RecCom 15 (The Use of Alternative Materials in Marina Construction) — Terrence Browne

RecCom 17 (Guidelines for Marina Design) — Dennis Kissman

RecCom 130 (Anti-sedimentation Systems for Marinas and Yacht Harbors) - Richard Dornhelm

RecCom 131 (Catalogue of Marina Construction Elements) – no U.S. representative

RecCom 132 (Dry Stack Storage) – Tonu Mets

RecCom 133 (Economic Aspects of Recreational Navigation) – Michael Herrman

RecCom 134 (Design and Operational Guidelines for Superyacht facilities) – Mark Pirrello

EnviCom 11 (Management, Dredged Material Re-use and Transformation of Existing Confined Disposal Facilities) — Dr. Michael Palermo and Dr. Paul Schroeder

EnviCom 12 (Sustainable Waterways within the Context of Navigation and Flood Management) — Dr. Craig Fischenich and John Clarkson

EnviCom Expert Group 2 (Environmental Benefits of Waterborne Transport) — Keith Hofseth (chair), Alfred Cofrancesco and Nick Pansic

EnviCom 15 (Environmental Aspects of Dredging and Port Construction Around Coral Reefs and Cold Water Hard Bottom Benthic Communities) — Dr. Mark Sudol and Russ Kaiser

EnviCom 16 (Management of Ports and Waterways for Fish and Shellfish Habitat) — Dr. Douglas Clarke

EnviCom Expert Group 3 (Climate Change and Navigation) — Dr. James Corbett

EnviCom 136 (Recommendations for Sustainable Maritime Navigation) – David Moore

CoCom 2 (Best Practice for Shoreline Stabilization Methods) — Lesley Ewing

CoCom 126 (Training in Ports and Waterways) – Dr. Billy Edge

IWR and U.S. Section PIANC Coordination with the Organization of American States, Inter-American Committee on Ports: IWR, through the U.S. Section-PIANC, participated in the Third Hemispheric Conference on Port Security of the OAS Inter-American Committee on Ports (OAS-CIP) during FY 2008 held in April 2008 in Punta Cana, Dominican Republic. The CIP serves as a permanent Inter-American forum for port related issues among the 34 member states of the OAS. Its purposes include serving as the principal advisory body of the OAS on all topics concerning development in the port sector. It proposes and promotes hemispheric cooperation policies, improvements and port sector cooperation agreements, and the collection and dissemination of data and information. The U.S. delegation to the OAS-CIP is led by the Maritime Administration, USDOT, under guidance of the State Department, and with participation by the Coast Guard, EPA, and the Corps (through observer status for PIANC-US). The CIP currently has four active Technical Advisory Groups (TAGs). These include Port Operations, Port Security (chaired by the U.S.), Navigation Safety, and Environmental Protection. The U.S. became a new member of the TAG on Environmental Protection in 2007 and is now a member of all four TAGs. The U.S. Section-PIANC is engaging the CIP to explore opportunities to share expertise on port management, development of common standards, improving dredging technology, addressing ballast water issues, and potentially assist plans for inland waterway development in the Amazon and Parana-Paraguay basins. IWR, through PIANC-US, will participate in two CIP meetings in FY 2009, including the Executive Board in Buenos Aires, Argentina, in April 2009 and the full CIP all-delegations meeting in El Salvador in September 2009.