A Mental Modeling Approach for Designing and Implementing the USACE's Engineering With Nature Initiative

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US Army Corps of Engineers
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The Challenge
Status Quo is Not an Option

- The USACE faces a number of challenges:
  - Amount of time and the costs required to implement and operate projects are increasing due to such factors as increasing energy costs, inter-agency coordination and consultation, regulatory compliance issues, market pressures.
  - USACE infrastructure and operations viewed by stakeholders as being in conflict with environmental and social interests.
  - Environmental expectations and regulatory requirements for projects steadily increased over last 25 years.
  - The effective budget for the USACE has been decreasing over a period of many years and expect a constrained budget over the short and long-term.

The Opportunity

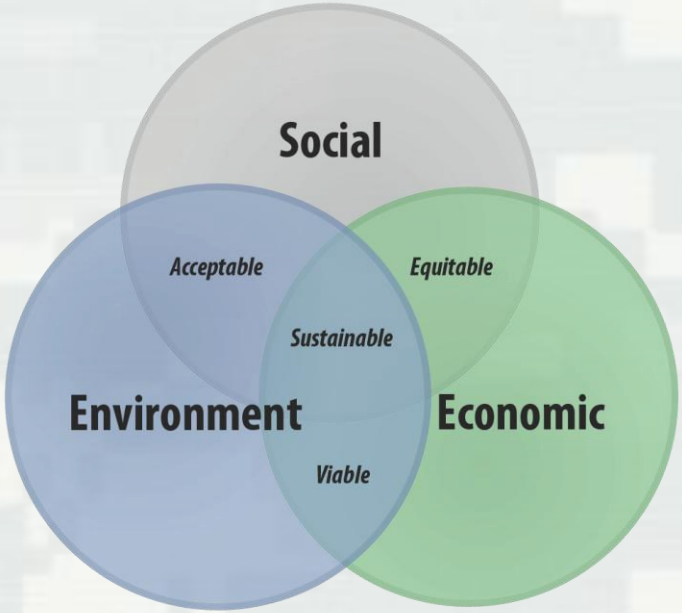
- A new approach is needed to capitalize on the synergy between building/operating water infrastructure and interactive collaboration with our partners that can:
  - Improve stakeholder engagement, collaboration, communications and decision making;
  - Produce integrated water resources solutions on project and regional scales;
  - Reduce time and costs required to meet project objectives;
  - Expand the range of project benefits to include economic, social and environmental benefits;
  - Broaden and sustain the base of support for projects with community of partners and stakeholders; and
  - Build respect and credibility for USACE, its decisions and actions.

Engineering With Nature…

…the intentional alignment of natural and engineering processes to efficiently and sustainably deliver economic, environmental and social benefits through collaborative processes.

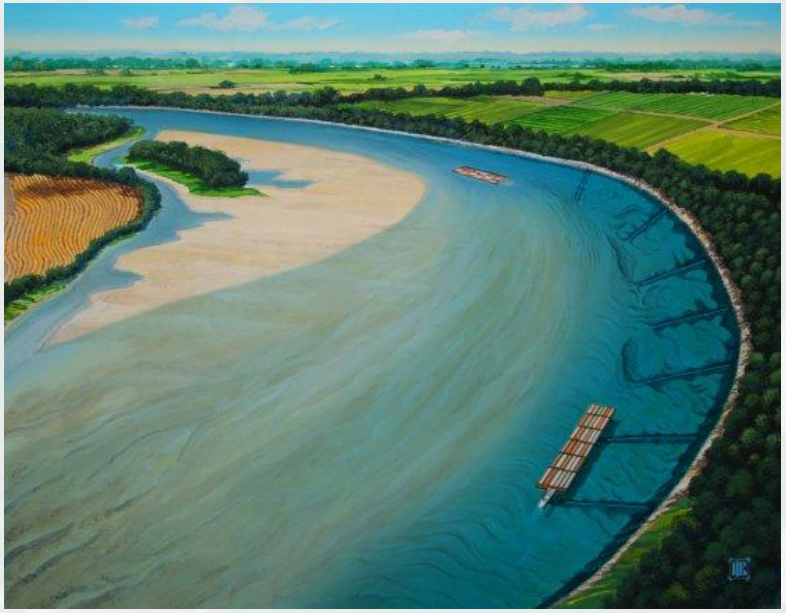
Key Ingredients

- Science and engineering that produces operational efficiencies
- Using natural process to maximum benefit
- Broaden and extend the benefits provided by projects
- Science-based collaborative processes to organize and focus interests, stakeholders, and partners



Example EWN Solutions

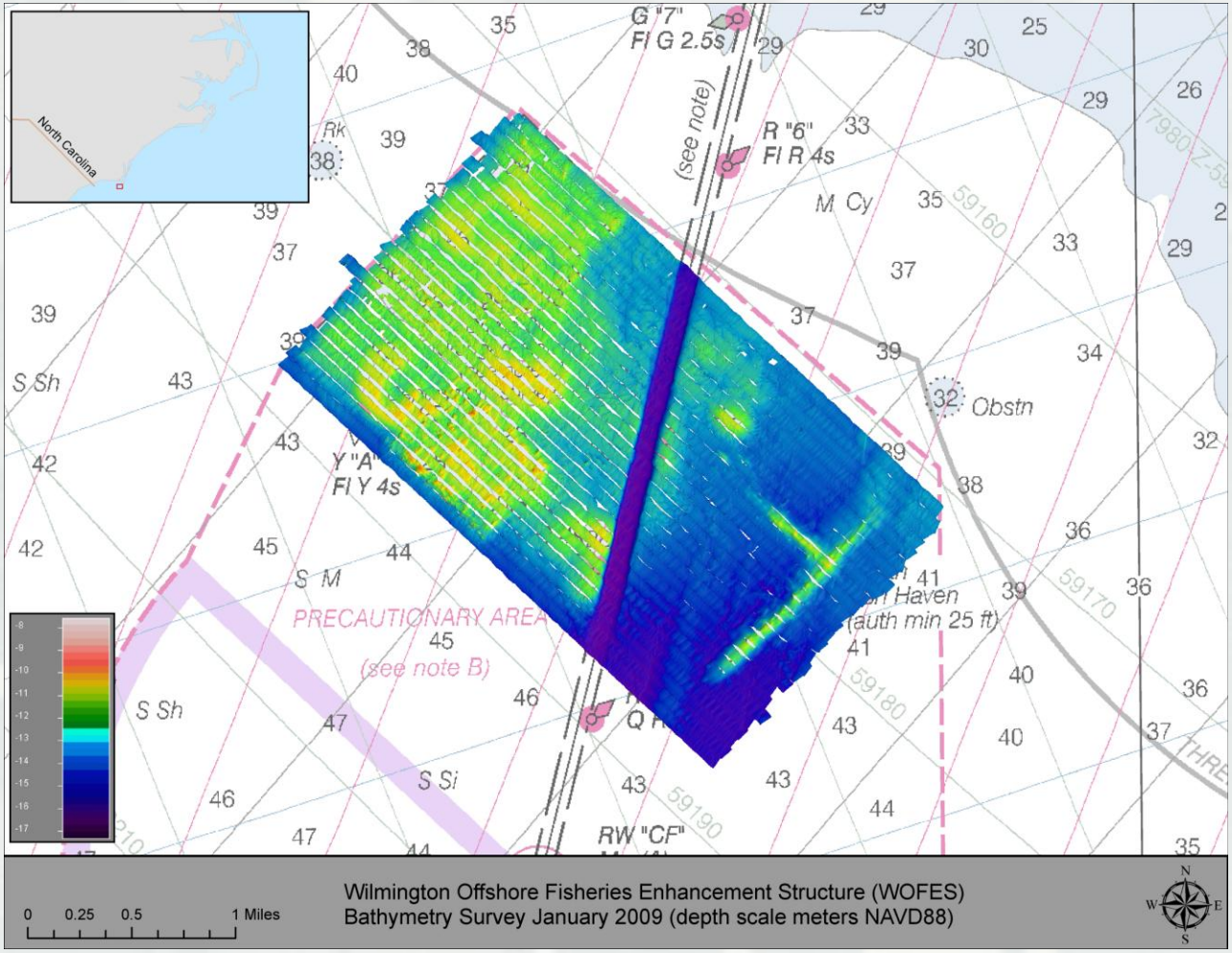
Upper Mississippi River Training Structures: Chevrons



River Bendway Weirs

Environmentally Enhanced Breakwater Toe Blocks

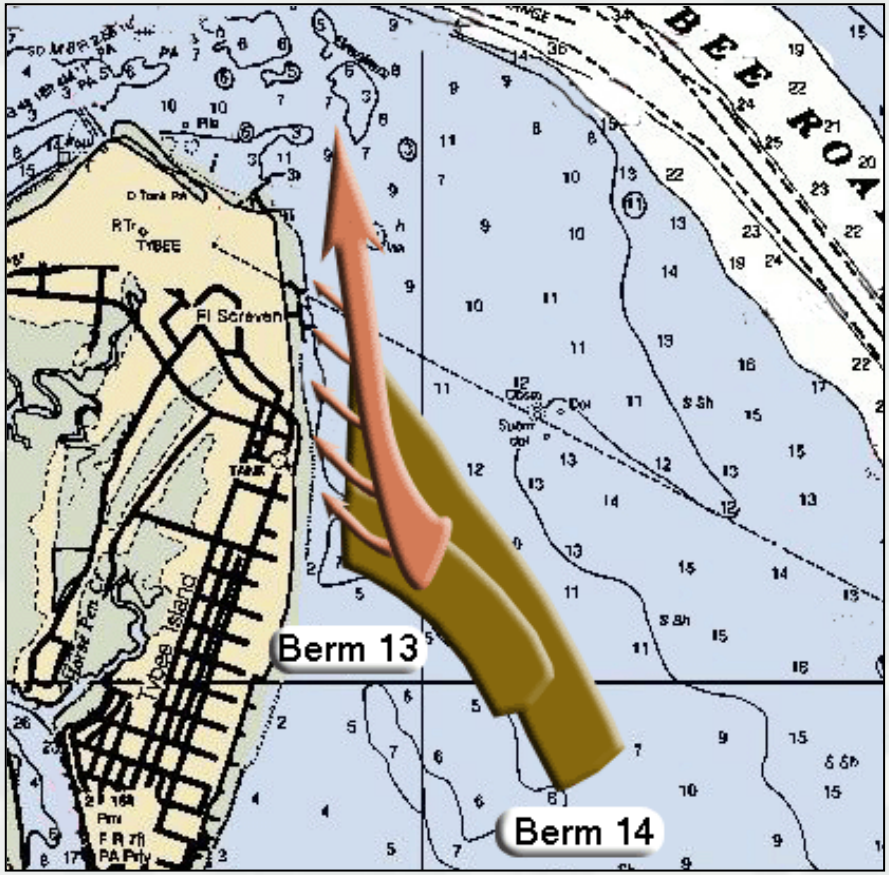
Example EWN Solutions



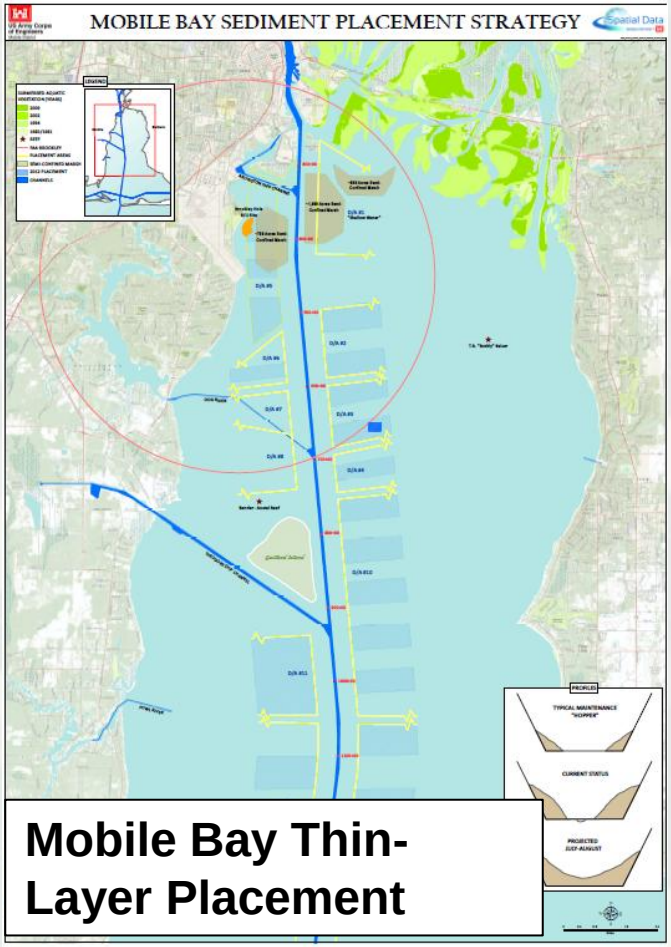
Wilmington Offshore Fisheries Enhancement Structure

Example EWN Solutions

Strategic Sediment Placement



North Tybee Island
Savannah, Georgia



Mobile Bay Thin-Layer Placement

Mental Modeling Approach

- The Mental Modeling Approach has been used effectively in many applications, including organizational transformation, to develop robust solutions that incorporate the values, beliefs and priorities of stakeholders. It is ideally suited to opportunities where:
  - Multiple stakeholders are or should be involved;
  - Disparate viewpoints must be elicited and synthesized;
  - Decisions are required among multiple potential options with a significant degree of consequence; and
  - Transparency is required when characterizing the opportunity, incorporating stakeholder input, and designing appropriate solutions;
  - The results must be sustainable.

Implementation Strategy
Engineering With Nature

- Over the next 5-7 years, we will implement Engineering With Nature across USACE through a strategy comprising four interrelated waves of activity:
  - **Wave I:** Build a Base of Support 2011 – 2013
  - **Wave II:** Focus R&D Investments 2011 – 2018
  - **Wave III:** Demonstrate EWN 2013 – 2018
  - **Wave IV:** Establish USACE Leadership 2015 – 2018

Wave 1

Build a Base of Support

- Concentrate efforts on building a base of support within USACE, while beginning to engage key external stakeholders.
  - Steering team established to guide the EWN initiative. Twice annual workshops; ongoing collaboration.
  - Identification of and outreach to early adopters – internal and external.
  - Presentations, engagement, outreach to gain support for EWN within the water infrastructure ommunity.
  - Mental models research with key internal and external stakeholders to further refine and develop plans, including the Collaborative Framework.
  - Next: Development of a Collaborative Framework for EWN integrating behavioral and communications sciences with engineering and natural sciences. Purpose: to gain insight from and build support and commitment of early adopters in key partner agencies and key stakeholder organizations.

EWN Internal and External Research

MM Research Summary

- Interviews with 22 internal USACE stakeholders represented a diverse population across specialty areas and geography were conducted in July and August of 2012, averaging 56 minutes:
  - Specialty Areas: Senior Leadership, Research, Navigation, Flood Risk Management, Operations and Regulatory, Coastal, Planning, Environment, Water Resources
  - Geographical Areas: Washington DC, Mississippi, Florida, New York, Massachusetts, Texas, Oregon, Alabama, New Jersey, South Carolina, Nebraska
- Interviews with 34 external stakeholders again represented a diverse population of stakeholder types and geographical areas were conducted in October and November 2012, averaging 37 minutes:
  - Stakeholder Types: Academia, Federal Government Agencies, State Government Agencies, Non-Governmental Organizations, Private Industry and European Experts with Related Expertise.
  - Geographical Areas: Those with responsibilities and expertise in coastal areas, rivers and lakes.

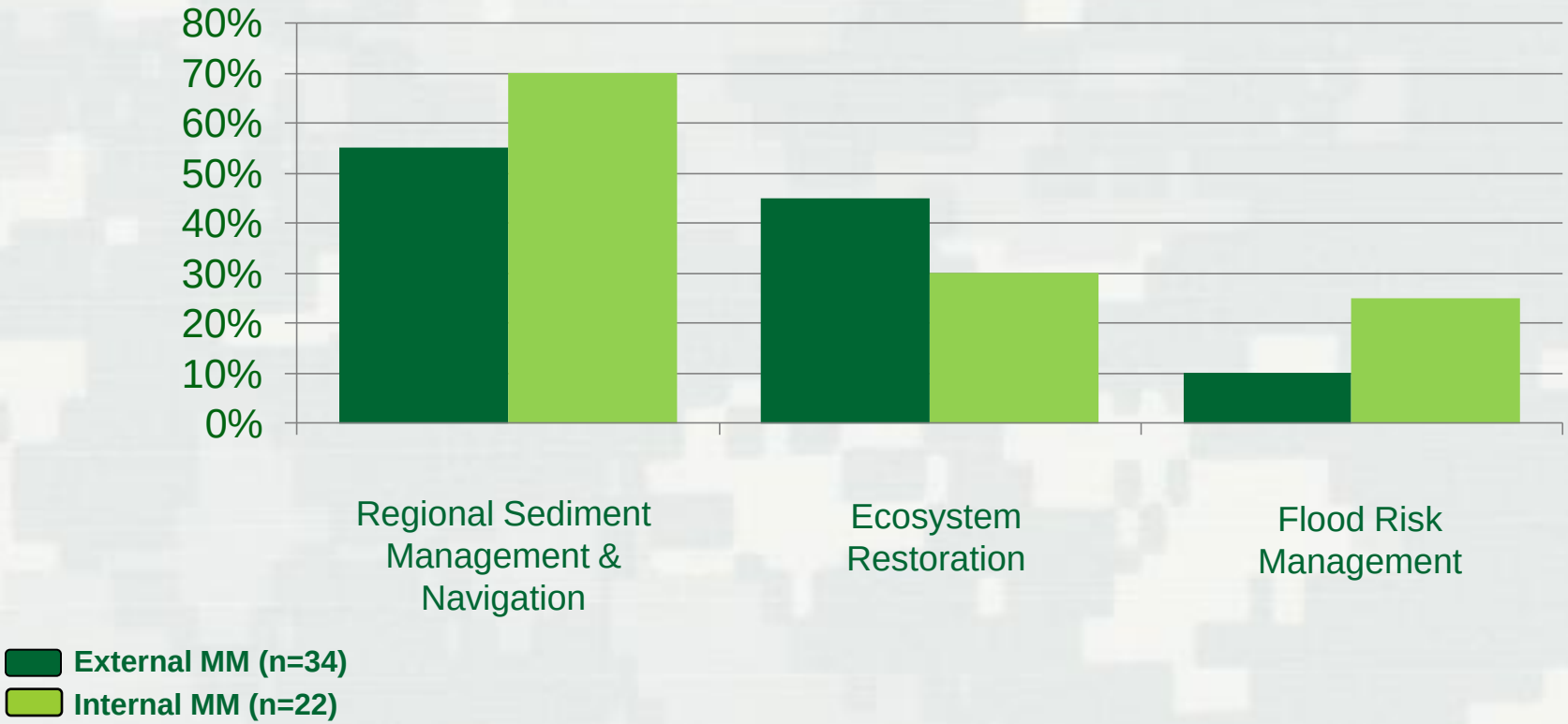
EWN Internal and External Research

External MM Research Participants

- Organizations included in external research includes:
  - Academia: University of Maryland, University of New Orleans, Colorado State University, Virginia Institute of Marine Science.
  - Federal Government Agencies: USFWS, USEPA, USGS, NOAA, USBR, CMTS
  - State Government Agencies: Delaware, Louisiana, New Jersey, Florida, Wisconsin, Indiana
  - Non-Governmental Organizations: Restore America's Estuaries, Ducks Unlimited, National Wildlife Federation, Lake Ponchatraine Bay Foundation, Surfrider
  - Private Industry: Great Lakes Dredge and Dock, Weeks Marine
  - European Experts with Related Expertise: Federal Hydraulic Institute, Germany; University of Nottingham, UK; Ecoshape, Royal Boskalis, The Netherlands

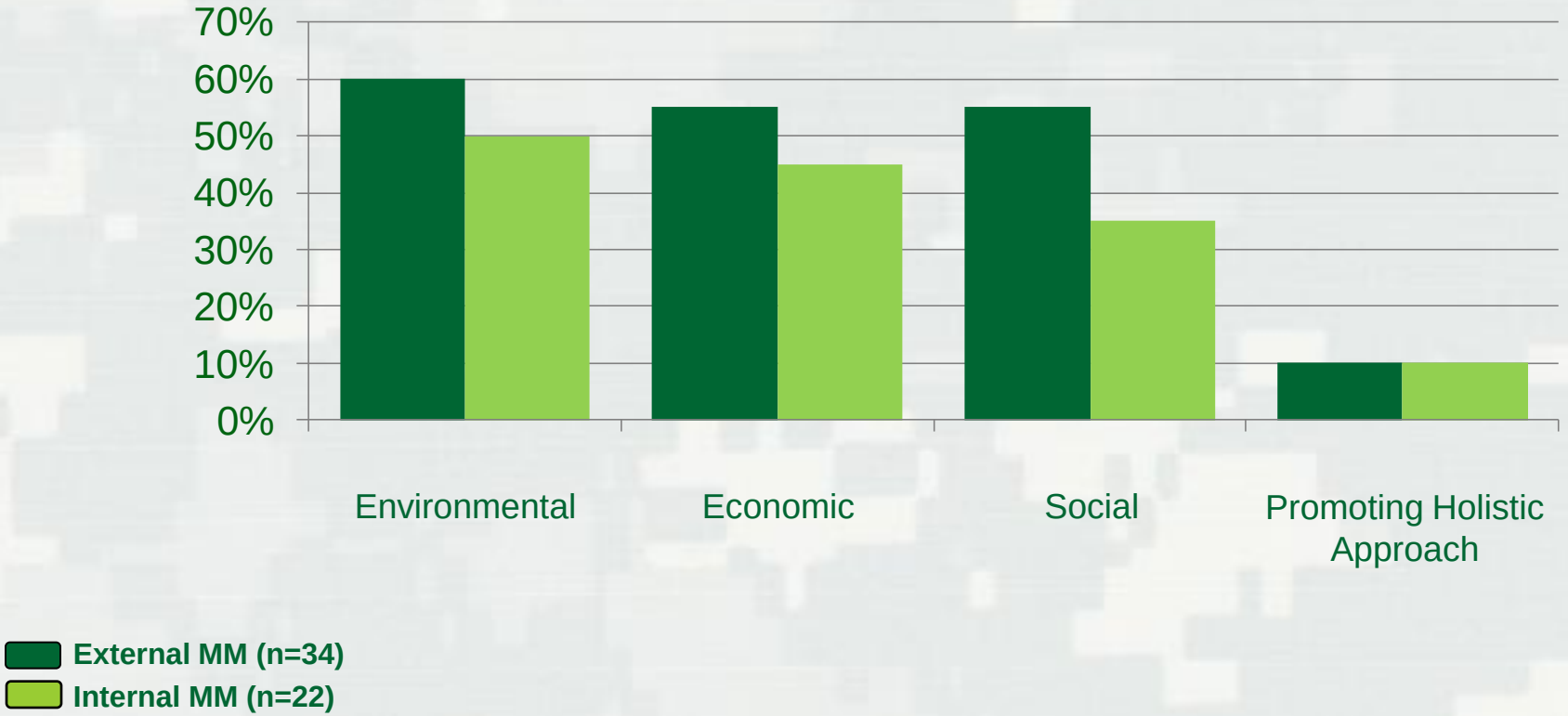
Best Projects for EWN

Project Types Recommended by Interviewees



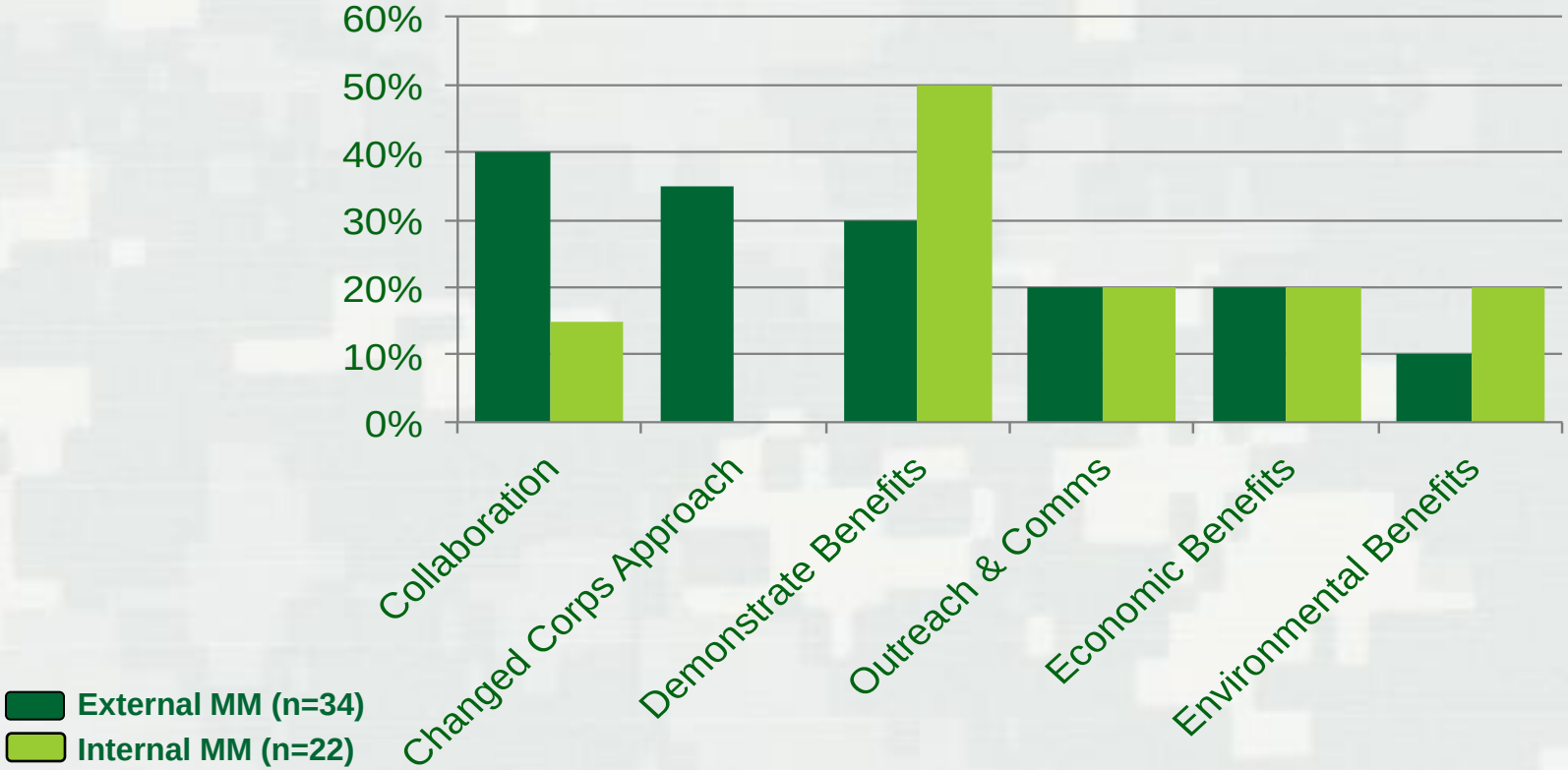
Benefits of EWN

Benefits Mentioned by Interviewees



Influences on Stakeholder Interest

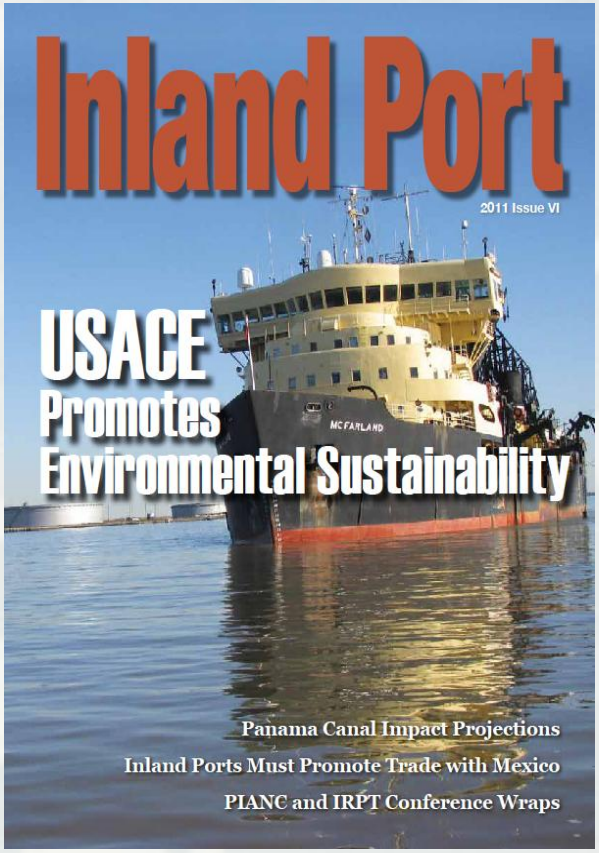
Key Influences on External Stakeholder Interest in EWN



EWN Internal and External Research

Key Findings

- Overall, interviewees were positive and supportive of the EWN approach.
- Many emphasized a demonstration project highlighting a successful, effective application of EWN would be the most important influence on engaging and encouraging adoption of EWN.
- Internal interviewees suggested that all internal USACE stakeholders need to be engaged to ensure successful adoption of EWN.
- External stakeholders encouraged USACE to engage in early and ongoing dialogue and collaboration with all key project stakeholders.
- Many underscored the importance of USACE leadership in supporting and promoting EWN, as key to encouraging adoption.

Engineering With Nature

- Expand the range of benefits provided through water-based infrastructure
  - “Doing more with less”
- Balancing consideration of environmental risks with **benefits**
- A path to more sustainable projects