USACE Civil Works Program: Transformation & Collaboration

California Marine Affairs and Navigation Conference (CMANC)

Steven L. Stockton, P.E., F.ASCE Director of Civil Works U.S. Army Corps of Engineers 15 January 2015





Changing Perspectives on Infrastructure



1) Nation-Building: 19th Century

1a: Nation Building: Starting the Task

1b: Nation Building: Completing the Phase



- >1817 Start construction of the Erie Cana
- >1826 Omnibus Rivers and Harbors Act
- >1828 Start Construction of Chesapeake & Ohic Canal
- >1862 Homestead Act and Westward expansion
- (Value of navigation: interior river systems)
 >1871 US Commission on Fish and Fisheries
 >1879 Mississippi River Commission

>1902 Reclamation Act
>1902 Reclamation Service
>1905 National Forest Service
>1909 National Conservation Commission
>1912 National Waterways Commission
>1914 Panama Canal completed
>1916 National Park Service
>1917 Flood Control Act (first)
>1920 Federal Water Power Act
>1920 Federal Power Commission

1927 Rivers and Harbors Act
 1927 Great Mississippi River Flood
 1928 Boulder Canyon Project Act





2) Economic Efficiency: Early-Mid 20th Century >1928, 1936, and 1938 Flood Control Acts

2a: Economic Efficiency: Harnessing Nature

2b: Economic Efficiency: System Build-Out





The 20th Century "Golden Age" of Infrastructure Construction





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3) Environmental Awakening: Late 20th Century

3: Environmental Enlightenment: Waking Up to Consequences

4: Emerging Refocus: Adaptation, Sustainability, & Resilience



>1962 "Silent Spring" published >1969 Cuyahoga River Catches Fire - again >1969 National Environmental Policy Act >1970 Rivers and Harbors Act, Section 209 >1970 Council on Environmental Quality >1970 Environmental Protection Agency >1973 National Water Commission report >1973 Endangered Species Act >1974, 1986, &1996 Safe Drinking Water Acts >1977 Clean Water Act >1980 CERCLA >1986 Federal Power Act >1986 Water Resources Development Act >1986 FEMA takes over Interagency Flood Management TF >1989 Escalating Federal involvement in Everglades Rest'n Building a 21st Century Infrastructure & Infrastructure TF "We Can't Wait" Port Modernization Build America Investment Building a Clean Energy Economy Climate Action Plan □ Federal Sustainability Strengthen Global Resilience to Climate Change

Climate Change Adaptation Task Force
 Task Force on Climate Preparedness and Resilience
 Hurricane Sandy Rebuilding Task Force
 Gulf Coast Restoration Task Force



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CW's Economic Benefits & Revenues to Treasury

(2010-2012 Average)

Each dollar spent on the USACE Civil Works program generated ~ \$16 in economic benefits and \$5 in revenues to the U.S. Treasury.

Program	NED Benefits (Billions of Dollars)	Net NED Benefits (Billions of Dollars)	U.S. Treasury Revenues (Billions of Dollars)
Flood Risk Management	\$59.47	\$58.84	\$18.90
Coastal Navigation	\$9.47	\$8.70	\$3.70
Inland Navigation	\$8.10	\$7.51	\$2.07
Water Supply	\$7.00	\$6.98	\$0.09
Hydropower	\$2.30	\$2.11	\$1.37
Recreation	\$3.20	\$2.91	\$1.13
Leases and Sales			\$0.03
Total Annual NED	\$89.54	\$87.05	\$27.29



Net NED benefits are defined as NED benefits less the costs of operations, maintenance, and investigations. Since the costs associated with expenses and oversight by the Assistant Secretary of the Army (ASA) serve all Corps programs, including those we did not calculate benefits for in this report, this report does not account for those costs.".



The Benefits and Revenues numbers are not additive. 7

1927 vs. 2011 Mississippi River Record Flood: From "Levees Only" to "Room for the River"

- 1927 Flood = 16.8 M acres (Challenge)
- 2011 Flood = 6.35 M acres (Response)
- \$230 B damages prevented

 \$612 B since 1928
 44 to 1 ROI
- \$7 B in crop damages prevented
- 4.5 million people protected
- \$3B Annual Transportation Rate Savings





But What's Happening to Our Infrastructure Value?

- Much of USACE's water infrastructure was built between 1930 and 1982.
- Many structures have reached or exceeded their design life.
- The estimated peak value of USACE infrastructure was about \$237 billion (in 2011 dollars) in 1982 and has fallen, due to natural degradation, to about \$164 billion in 2011, a decline of almost 31 percent (USACE 2012).
- Meanwhile, operating demands on USACE's infrastructure have grown and changed dramatically over the last 30 years.





USACE Capital Stock Value by Functional Category, 1928 to 2011



2013 Report Card for America's Infrastructure



by the American Society of Civil Engineers

America's Cumulative G.P.A.

Aviation	D	Ports	C
Bridges	C+	Public Parks & Recreation	C-
Dams	D	Rail	C+
Drinking Water	D	Roads	D
Enerav	D+	Schools	D
Hazardous Waste	D	Solid Waste	B-
Hazardous Waste Inland Waterways	D D-	Solid Waste Transit	B- D

A = Exceptional B = Good C = Mediocre D = Poor F = Failing



Estimated investment needed by 2020 =



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\$3.6 Trillion

Relative Quality of US Infrastructure

The World Economic Forum ranks US infrastructure behind that of most other comparable advanced nations

Overall infrastructure quality index, 2012-13

Top 15 of 144 countries

Scale: 1 = Extremely underdeveloped; 7 = Extensive and efficient by international standards



SOURCE: World Economic Forum; McKinsey Global Institute analysis

Water Infrastructure Spending

Water Infrastructure: Sources of Nondefense Investment, 1962 to 2010

Source: Congressional Budget Office based on data from the Office of Management and Budget, the Census Bureau, and the Bureau of Economic Analysis. For details, see the appendix. Between 1962 & 2010...

Total funding increased % GDP decreased

Greater burden on state and local funding sources as infrastructure ages.

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John F. Kennedy: The Last Great Positivist?

We are a great and strong country ... but greatness and strength are not ... gifts which are automatically ours forever. It took toil and courage and determination to build this country - and it will take those same qualities if we are to maintain it. For, although a country may stand still, history never stands still. Thus, if we do not soon begin to move forward again, we will inevitably be left behind. ... But effort and courage are not enough without purpose and direction.

"A society grows great when old men plant trees whose shade they know they shall never sit in."

Greek Proverb

U.S. Ports and Inland Waterways: Vital to our National Economy

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A Report to Congress Addressing "the Critical Need for Additional Port and Inland Waterway Modernization to Accommodate Post-Panamax Vessels"

U.S. Port and Inland Waterways Modernization: Preparing for Post-Panamax Vessels

Institute for Water Resources

U.S. Army Corps of Engineers

US Army Corps of Engineers. June 20, 2012

U.S. Port and Inland Waterways Modernization Strategy

- Focus: How Congress should address critical need for additional port and inland waterway modernization to accommodate post-Panamax vessels.
- Factors to address:
 - Costs associated with deepening and widening channels;
 - Ability of waterways and ports to enhance export initiatives benefitting the agricultural and manufacturing sectors;
 - Current and projected population trends that distinguish regional ports and ports that are immediately adjacent to population centers;
 - Inland intermodal access;
 - Environmental impacts resulting from modernization of inland waterways and deep-draft ports.

Trends

- Population and incomes are growing worldwide and within the U.S.
- Trade follows growth in population and income. It has increased 100-fold since 1950

◆ Agricultural products ■ Fuels and mining products ▲ Manufactures

Source: World Trade Organization; International Trade Statistics. 2011

U.S. Population Growth Expected to Be Greatest in the South and West

Source: U.S. Census Bureau, Population Division; 2005 Interim State Population Projections Figure 5: Percent Change in Population by Region of U.S. 2010-2030

Source: U.S. Census Bureau, Population Division; 2005 Interim State Population Projections Figure 6: Change in Population by U.S. Region 2010-2030

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U.S. Trade to More than Double

2008 - 2028

Millions of TEUs

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"Megaship" Fleet on the Rise

Source: MSI

Figure 16: Historical and Forecast Fully Cellular Container by TEU Band 2000-2030

Ever Larger Containerships Driving Need for Ever Larger Channels

Potential Post-Panamax Ports

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U.S. Harbor Deepening Challenges

- Study Process: Difficult and lengthy from study to authorization
- Funding: Federal appropriation process uncertainties
- Dredging: Escalating costs, placement, environmental mitigation
- Handling Facilities and Space: Need expanded cargo handling facilities and improved intermodal connections

Environmental Impacts

- The navigation system and port expansion have environmental impacts. Negative impacts must be mitigated. If not fully mitigated, impacts could include:
 - Degraded air and water quality that threatens human health and safety, especially of low income and minority groups;
 - Loss of important natural and cultural heritage found in parks, refuges, wetlands and scarce species; and
 - Loss of recreation, commercial and other economically important resources.
- Those mitigation costs can be significant and will play an important role in investment decisions.

(Zebra Mussels)

Resilience of the Marine Transportation System (MTS)

A *resilient* Marine Transportation System prepares, resists, recovers, and adapts to successfully function under the stress of disturbances.

Successful Functioning of the MTS means safely transporting required tonnage between ports in least time at least cost Disturbances can be **natural** (storms, floods, earthquakes) or **anthropogenic** (oil spill, fuel embargo, terrorism)

The Current Situation

- We are in a non-earmark environment
- We fund too many studies/projects at less than capability
- It takes too long to get studies and projects completed and costs too much!!
- We make sponsors and stakeholders unhappy due to lack of timeliness and cost effectiveness
- In a budget constrained era, we must do what it takes to Be RELEVANT!!
- All of which adds up to

Transforming Civil Works Deliver enduring & essential water resource solutions by applying effective transformation strategies.

Infra-

structure

Strategy

Budget Developm ent Transform -ation

Planning

Moderniz-

ation

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Delivering

Quality

Solutions

Services

Planning Modernization

People, Program, Projects, Process .

A streamlined project planning process that delivers timely, cost effective and high quality water resources investment recommendations for authorization.

- Studies must continue to inform investment decisions
- Improved time, schedule, and alignment of studies (SMART guidelines of "3x3x3" is now the law)
- Prioritize studies to account for funding constraints, and identify gaps to meet the nation's need
- A reduced planning study portfolio
 - 38 Chief's reports completed
 - 9 Chief's reports to be completed Dec 2014
 - Reduced portfolio from 650 to 158

Budget Development Transformation

A systems budgeting approach that enables development of comprehensive integrated water resources investments

- <u>Operationalize</u> integrated water resource management by Water Informed Budget Execution
- Expand <u>watershed-informed pilots</u> to include a majority of our projects
- Engage stakeholders to identify opportunities investment priorities
- Standardize business process that utilize watershed approaches

Quality Solutions & Services

Solutions and services are delivered effectively, efficiently, sustainably.

- Keep our commitments <u>Deliver</u> projects on time and budget (public trust & confidence is a "resource driver")
- Enhance technical competency and methods of delivery (knowledge management, information sharing, policies, guidance, etc)
- Consistently deliver <u>quality technical solutions</u> (leverage CX's and Review Processes)
- Restore, protect, and manage our <u>aquatic resources</u>
- Develop and implement a <u>climate preparedness and resilience</u> roadmap
- Complete <u>regulatory decisions faster</u>

Infrastructure Strategy

A resilient, reliable, sustainable water resources infrastructure system

- Asset Mgmt, Apply Life Cycle Portfolio Mgmt, and Alternative Financing (P3 Pilots, and other mechanisms) and O&M Efficiencies
- Optimize O&M efficiencies by Completing regional level of service analyses and optimization plans
- Alternative financing, reduce time with model contributed funds agreements and <u>identify public-private partnership</u> (P3) projects
- Coordinated systems (within watershed) based <u>investment decisions</u> apply WRRDA and make divestiture decisions

Water Resources Reform & Development Act

- Approved by House 20 May (vote of 412-4); Senate two days later (vote of 91-7). Signed by President 10 Jun.
- Authorizes 34 projects and feasibility studies, valued at \$12 billion, de-authorizations \$18 billion.
- New process to provide a list of recommended projects
- "3x3x3" rule codified in law
- Repeals requirement for reconnaissance studies

WRRDA 2014 Listening Sessions

Aug 13: Deauthorizations & Backlog Prevention; Project **Development and Delivery (Incl. Planning)** Aug 27: Alternative Financing; Credits Sep 10: Levee Safety; Dam Safety; Regulatory Program Sep 24: Non-Federal Implementation; Water Supply and **Reservoirs; Navigation** Written suggestions or recommendations can be submitted by email to wrrda@usace.army.mil. USACE's WRRDA website will be updated as more information and implementation guidance becomes available. The website can be found at: http://www.usace.army.mil/Missions/CivilWorks/ProjectPlan ning/legislativelinks.aspx.

WRRDA 2014 Navigation Provisions

Harbor Maintenance Trust Fund (HMTF)

- 67% of funds collected in 2014 actually go for harbor maintenance,
- Rate rises to 100% of funds collected in 2024.

Inland Waterways Trust Fund (IWTF)

 Review of ways to increase revenue collections for inland waterways. (increased fuel taxes, user fees, construction bonds, etc.)

Water Resources Reform & Development Act Non-Federal Contributions

Non-federal entities can:

- Conduct projects authorized by Congress on their own
- Contribute funds for any study or project Corps deems in public interest
- Fund locks where Corps has proposed to reduce operations
- Receive assistance for drinking water, wastewater and other water infrastructure.

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 Corps authorized to enter into agreements with non-federal interests, including private entities, to finance at least 15 water projects.

Water Resources Reform & Development Act Other Provisions

- EIS process must be timely and concurrent with other federal, state, local or tribal review process
- Nonstructural alternatives for damaged flood control projects
- National Levee Safety Initiative
- Inventory of all levees
- New authorities to respond to extreme weather.
- Corps to conduct inventory of properties it controls, with eye to disposing of unneeded property.

WRRDA Implementation

- Execution is an Executive Branch responsibility
 - Purpose of WRRDA
 Implementation Guidance is to determine how
 Administration/Agency will
 proceed under new law in light of current policies and procedures;
 <u>or</u> to
- Develop new policies and procedures where needed to implement the law.
- Intent is to ensure consistent application across Corps.
- Guidance issued in form of memoranda, EC's or ER's.

Not all provisions in law may be funded or implemented as a matter of policy.

What Can We Do, Together?

- Tell the Story Infrastructure's Value to Nation
 Improve delivery of projects and programs on schedule and under budget
- Leverage Efforts
- Collaborate with ALL stakeholders and beneficiaries of the Civil Works Program
- Find consensus for major initiatives
- Identify funding to reach outcomes
- Involve & engage end-users
- Seek to influence decision-makers
- Facilitate a Watershed-Informed approach
- Help the Nation prioritize efforts, programs, and projects
- Take the long view Look at infrastructure needs more than one budget cycle at a time

Better and more sustainable decisions and solutions.

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Model Contributed Funds Agreement

- Draft guidance for
 contributed fund
 arrangements for O&M
 Dredging has been drafted.
- Overall WRRDA guidance for contributed funds anticipated by the end of Jan or early Feb 2015.
- Because draft guidance builds off overall guidance for WRRDA contributed funds, we will wait for that guidance to be complete, then route guidance specific to O&M dredging for approval

We will implement performance metrics in 3rd Quarter FY 15.

Some "Inevitable" Empires

Collaboration

- We cannot be successful as an organization unless we are successful at collaboration and relationship management.
- We must make learning collaborative techniques a priority.
- We must maintain focus on transparency and stakeholder engagement <u>during plan</u> formulation.
 - Replace culture of completing a study, then distributing for stakeholder/public comment only after USACE (with sponsor) has developed the recommended plan.

Grand Winner: ASCE Outstanding Civil Engineering Achievement Award!

- The American Society of Civil Engineers (ASCE) awarded USACE's Inner Harbor Navigation Canal Surge Barrier, part of the Hurricane & Storm Damage Risk Reduction System, New Orleans, LA, the 2014 Outstanding Civil Engineering Achievement (OCEA) Award on March 20, 2014.
- First Corps project winner in the award's 54 year history!

\$1.35 B design-build project is a credit to our team: the Corps, State of Louisiana, industry, academia, and community we serve.

The United States: The Inevitable Empire?

Mississippi River Debates

Humphreys v Ellet (1852-1866)

- Framed in context of military vs. civilian engineer instruction
- Levees & Natural Outlets vs.

Levees, Reservoirs & Artificial / Natural Outlets

• 1866 Humphreys becomes Chief -- Delta Survey becomes dogma within Corps; reservoirs, outlets and cutoffs championed by private sector

Humphreys v Eads (1874-1879)

- Canal v Jetty system to open mouth of Mississippi River
- 1879 Eads prevails; MRC created giving Civilians a voice.

Cutoffs to Lower Flood Stages (1884-1932)

- Prominent engineers propose cutoffs to lower flood stages, but MRC and Corps staunchly oppose.
- 1932 Congressional Resolution authorizes cutoffs; 16 cutoffs executed by 1945. Cutoffs still lower stages in 2011

Jadwin vs. Mississippi River Commission (1927-1945)

- Jadwin = smaller levees, large uncontrolled floodways (outlets), no reservoirs;
- MRC = higher levees, smaller controlled floodways, further study on reservoirs

• 1928 FCA authorized Jadwin Plan; later modified to include controlled floodway at Morganza and Reservoirs

On America's Inland Waterways

"Prompted by these actual observations, I could not help taking a more contemplative and extensive view of the vast inland navigation of these United States ... and could not but be struck with the immense diffusion and importance of it; and with the goodness of that Providence which has dealt his favors to us with so profuse a hand.

Would to God we may have wisdom enough to improve them."

George Washington 1783

INLAND CHINA FIXED ASSET INVESTMENT GROWTH (2007-2011)

CW Spending as Percent of GDP

As %of GDP, USACE CW spending has declined from 0.8% (1935) to ~ 0.035% today Today's spending represents a decline by a factor >20 as % of GDP

Current spending levels will not sustain services levels

U.S.ARM

Reserve Container Port Capacity by Coast

Metric	N. Atlantic Ports	S. Atlantic Ports	Gulf Ports	West Coast Ports
2010 TEU	8,239,000	6,687,000	2,409,000	18,960,000
Reserve CY Capacity-TEU	10,612,402	13,869,035	2,669,003	10,484,996
Reserve Crane Capacity – TEU	20,895,164	12,501,742	4,423,466	37,237,002
Reserve Berth Capacity – Vessel Calls	9,964	4, <mark>013</mark>	1,105	13,923
Reserve Berth Capacity – Avg. Vessel Basis	11,832,298	1,922,907	2,799,609	53,031,819

Source: USACE Institute for Water Resources

Prepare:

Measuring System Vulnerabilities

Monitoring System Performance

Recover:

Nearshore Dredged Berms

Innovative Materials

Entrance to Tampa Bay, FL

GIWW Project Areas Mixing Zones_300m Egmont Key Placement Area Pederal Channel Centerline Oustanding Florida Water With Aquatic Preserve 0 0.5 1 2 3 units

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Adapt:

Engineering With Nature

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

- Science and engineering that produces operational efficiencies
- Using natural process to maximum benefit

Acceptable

Environment

Equitable

Economic

Sustainable

Viable

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- Expanding the benefits provided by projects
- Science-based collaboration

Gaps in Innovative Technologies

- Innovative materials to achieve more robust, rapid repairs
- Novel dredging & placement capabilities
- Infrastructure lifecycle conditions
- Linkages between MTS, rail, road, air
- Systems optimization of ports, waterways, and operations
- Future of Navigation data access

National Academy of Sciences Report

- From 2008-2012, \$493M for Risk Reduction, \$12.8B for Relief
- •Misalignment of Economic Incentives - Local Zoning vs Federal Relief
- Strategic National Vision is Required
 - Economically Justifiable Solutions Constrained by Acceptable Risk
 - Should Consider a Wider Range of Costs and Benefits
 - Federal Leadership in Collaboration with State and Local Agencies

REDUCING

COASTAL RISK

Climate Change: Hydrologic Variability is Already a Challenge

- Hydrologic variability is already a challenge to water managers
 - Floods
 - Drought
 - Sea Level Change
 - Storms
- Impacts are being experienced across a diverse array of geographic regions and economic sectors

of the US

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Must Consider Long Lead Time and Long Service Life

Recapitalization and Resilience

White House Initiatives:

- Building a 21st Century Infrastructure
- "We Can't Wait" Port Modernization
- Infrastructure Task Force
- Build America Investment
- Building a Clean Energy Economy
- Climate Action Plan
- Federal Sustainability
- Strengthen Global Resilience to Climate Change
- Climate Change Adaptation Task Force
- Task Force on Climate Preparedness and Resilience
- Hurricane Sandy Rebuilding Task Force
 - Gulf Coast Restoration Task Force

How is the MTS Resilient?

Prepare:

Electronic Navigation Charts: Rapid & accurate channel surveys

USACE Dredging:

 Over-depth dredging anticipating future shoaling

Preparing for post-Panamax vessels

 Placement of sediment to protect prior to future storms

How is the MTS Resilient?

Resist:

Locks and Dams:

Water control to reduce flooding
Multiple lock chambers

Coastal Jetties:

- Reduce navigation channel infilling
- Improve navigability by reducing waves, currents

Resist:

Real-Time Monitoring

U.S.ARMY

Situational Awareness

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How is the MTS Resilient?

Recover:

Emergency Dredging Operations: Restore navigable depth

Alternative Ports: Facilitate functioning during downtime

How is the MTS Resilient?

Adapt:

Dredging: Deepening for post-Panamax vessels Aids to Navigation: Reposition ATON to mark safe passages

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