Nations Inland Infrastructure Crisis

“Opportunities and Challenges in America”

SAME Monthly Meeting
18 March 2015

William R. Chapman III, P. E.
Chief, Civil Works Integration Division
Great Lakes and Ohio River Division
U.S. Army Corps of Engineers
Agenda

- History and Influences on Future Civil Works Program
- Federal Budget Trends – “Then and Now”
- LRD Civil Works Infrastructure and Budget Analysis
- Future Drivers - The Upheavals
USACE FUNDING HISTORY:

THE VISION
### USACE CW’s Economic Benefits & Revenues to the 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.

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

**Notes:**

1. 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.

2. The Benefits and Revenues numbers are not additive.
The United States: The Inevitable Empire?
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
1a) Nation Building: Starting the Task

Analysis
- 1808 Gallatin Report

Key Legislation
- 1826 Omnibus Rivers & Harbors Act

Institutions Formed
- 1802 US Army Corps of Engineers
- 1871 US Commission on Fish and Fisheries
- 1879 Mississippi River Commission

Key Events
- Westward expansion - Value of navigation: interior river systems
  - 1817 Start construction of the Erie Canal
  - 1828 Start Construction of the Chesapeake and Ohio Canal
1) Nation-Building: 19th Century

1a: Nation Building: Starting the Task
- 1802 US Army Corps of Engineers formed
- 1808 Gallatin Report
- 1817 Start construction of the Erie Canal
- 1826 Omnibus Rivers and Harbors Act
- 1828 Start Construction of Chesapeake & Ohio Canal
- 1862 Homestead Act and Westward expansion (Value of navigation: interior river systems)
- 1871 US Commission on Fish and Fisheries
- 1879 Mississippi River Commission

1b: Nation Building: Completing the Phase
- 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

2a: Economic Efficiency: Harnessing Nature

- 1928, 1936, and 1938 Flood Control Acts
- 1933 Tennessee Valley Authority
- 1933 National Planning Board and multi-purpose plans for ten rivers
- 1935 National Resources Committee
- 1936 Flood Control act with benefit-cost language
- 1939 Bureau of the Budget
- 1939 Public Works Administration
- 1940 National Fish and Wildlife Service
- 1942 Gilbert White’s analysis adjustments to floods
- 1944, 1956, 1965 Flood Control Act
- 1947 River of Grass
- 1948 and 1956 Water Pollution Control Acts
- 1950 Presidential Water Resources Policy Cmsn
- 1952 House Subcommittee to Study Civil Works
- 1952 Circular A-47 Economic Analysis
- 1955 and 1965 Rivers and Harbors Act
- 1955 Pres. Cmsn on Water Resources Policy
- 1956 Federal Aid Highway (Interstate) Act
- 1958 Multiple-Purpose River Development
- 1962 Design of Water Resources Systems
- 1965 Water Resources Planning Act
- 1965 Water Resources Council
- 1966 Clean Rivers Restoration Act
- 1968 Wild and Scenic Rivers Act
- 1968 Flood Insurance Act
3) Environmental Awakening: Late 20th Century

- 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
- 1977 Clean Water Act
- 1980 CERCLA
- 1986 Federal Power Act
- 1986 Water Resources Development Act
- 1986 FEMA takes over Interagency Flood Management TF

4: Emerging Refocus: Adaptation, Sustainability, & Resilience

- 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
Our Nation’s Infrastructure: the 4 Rs

- Roads
- Runways
- Railways
- Rivers and Harbors
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
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
Changing Perspectives on Infrastructure

United States

- Resilience & Recapitalization
- Environmental Enlightenment
- Economic Efficiency
- Nation Building

Other Emerging Powers

Investments

Enabling

Hierarchy of Public Works Needs

Wear and Tear

Disabling

Driving Forces

- Agriculture - Food
- Industrial - Manufacturing
- Transportation
- Energy - Hydrocarbon
- Technology

Today

2010s
2000s
1980s
1960s
1940s
1920s
1900s
1800s

~75% of the US population was born after 1960.

Less than 25% of the population experienced the building of our nation’s key infrastructure.

~75% of the US population was born after 1960.

Less than 25% of the population experienced the building of our nation’s key infrastructure.
USACE FUNDING HISTORY:
VISION DEVELOPS INTO COMMITMENT.
WHICH THEN EVOLVES ... INTO BENIGN NEGLECT
Historical Investments by USACE Functional Category
1928 to 2011

Billions of FY 2011 Dollars

- $500 Billion Construction Investment
- ~$70.00 per person in the US!
- ~$56.00 per person in the US!
- ~$18.00 per person in the US!

Year


- Navigation
- Flood
- Multipurpose
- MR&T
- Dredging
USACE Capital Stock Value by Functional Category, 1928 to 2011

Coasting on Past Investments
Approx $87B NED Annual Benefits

Billions of FY 2011 Dollars

Year


USACE Capital Stock Value by Functional Category, 1928 to 2011

Navigation  Flood  Multipurpose  MRT  Dredging

Billions of FY 2011 Dollars

$-  $50  $100  $150  $200  $250  $300
Long Term Civil Works Funding Trends: Changing the Character of the Corps

Appropriation ($Million in 2012 $)
Components of Federal Spending: FY1962-FY2019


Source: CRS calculations based on data from the FY2015 OMB budget submission.
Water Infrastructure Spending

Between 1962 & 2010...

Total funding increased % GDP decreased

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

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.
## LRD Civil Works Program Comparison
### President’s Budget vs. Allocation of Funds

<table>
<thead>
<tr>
<th>Appropriation</th>
<th>FY11 PRES BUD</th>
<th>FY11 Allocation</th>
<th>FY12 PRES BUD</th>
<th>FY12 Allocation</th>
<th>FY13 PRES BUD</th>
<th>FY13 Allocation</th>
<th>FY14 PRES BUD</th>
<th>FY14 Allocation</th>
<th>FY15 PRES BUD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investigations</td>
<td>2.4</td>
<td>9.9</td>
<td>5.2</td>
<td>8.8</td>
<td>5.0</td>
<td>11.8</td>
<td>3.1</td>
<td>6.3</td>
<td>2.1</td>
</tr>
<tr>
<td>Construction</td>
<td>514.5</td>
<td>395.3</td>
<td>481.7</td>
<td>478.2</td>
<td>430.6</td>
<td>496.1</td>
<td>355.0</td>
<td>470.7</td>
<td>402.9</td>
</tr>
<tr>
<td>O&amp;M</td>
<td>437.8</td>
<td>475.3</td>
<td>437.1</td>
<td>469.8</td>
<td>430.6</td>
<td>471.1</td>
<td>456.4</td>
<td>497.3</td>
<td>474.9</td>
</tr>
<tr>
<td>Regulatory</td>
<td>27.0</td>
<td>27.0</td>
<td>27.3</td>
<td>27.3</td>
<td>26.2</td>
<td>26.2</td>
<td>28.3</td>
<td>28.3</td>
<td>27.7</td>
</tr>
<tr>
<td>FCCE</td>
<td>2.7</td>
<td>2.7</td>
<td>4.1</td>
<td>4.1</td>
<td>4.0</td>
<td>4.0</td>
<td>3.0</td>
<td>3.0</td>
<td>2.7</td>
</tr>
<tr>
<td>FUSRAP</td>
<td>43.0</td>
<td>43.0</td>
<td>37.4</td>
<td>37.4</td>
<td>35.7</td>
<td>35.7</td>
<td>23.3</td>
<td>23.3</td>
<td>30.7</td>
</tr>
<tr>
<td>Expenses</td>
<td>10.8</td>
<td>10.8</td>
<td>10.5</td>
<td>10.5</td>
<td>10.1</td>
<td>10.1</td>
<td>11.6</td>
<td>11.6</td>
<td>11.3</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>1,038.3</strong></td>
<td><strong>964.0</strong></td>
<td><strong>1,003.4</strong></td>
<td><strong>1,036.1</strong></td>
<td><strong>942.1</strong></td>
<td><strong>1,055.0</strong></td>
<td><strong>880.8</strong></td>
<td><strong>1,040.5</strong></td>
<td><strong>952.3</strong></td>
</tr>
</tbody>
</table>

### Work Plan allocations supplementing flat to declining Pres Bud

- FY11: $1,038.3
- FY12: $964.0
- FY13: $1,003.4
- FY14: $942.1
- FY15: $1,055.0

---

**$ Millions**

- **FY11**: 0 - 1,200
- **FY12**: 0 - 1,200
- **FY13**: 0 - 1,200
- **FY14**: 0 - 1,200
- **FY15**: 0 - 1,200

---

**BUILDING STRONG®**

**U.S. ARMY**
FY15 President’s Budget includes $102.5M for Great Lakes Navigation (O&M)

Legend
- 60 Federal Deep Draft Harbors/Channels
- 80 Federal Shallow Draft Harbors
- President’s Budget (23 projects funded)

Duluth-Superior $4.6M
Marquette $0.5M
Green Bay $2.9M
Grand Haven $0.5M
Milwaukee $2.1M
Calumet $2.5M
Chicago $2.6M
Indiana $13.8M
Chicago Harbor
Chicago River
Calumet
Burns $1.2M
Saginaw R. $3.0M
Monroe $1.0M
Soo Locks / St. Mary’s R. $35.2M
St. Clair R. $1.5M
Detroit R. $5.9M
Toledo $6.1M
Soo Locks
Black Rock $1.6M
Buffalo $1.3M
Cleveland $7.6M
Sandusky $1.6M
Ashtabula $2.2M
Fairport $1.2M

60 Federal Deep Draft Harbors/Channels
80 Federal Shallow Draft Harbors
President’s Budget (23 projects funded)
FY15 President’s Budget includes $403M for New & Ongoing Construction Activities

- Cleveland Harbor (NAV) $5.7M - Interim CDF expansion
- Calumet Harbor (NAV) $0.2M - P&S for CDF
- CSSC Fish Barrier (ENR) $29M - Cont. barrier 1
- McCook/Thornton Reservoirs (FRM) $18.5M - Cont. main tunnel
- Bluestone Dam (Dam Safety) $22M - Cont. Ph 4; E&D Ph 5
- Bolivar Dam (Dam Safety) $12.3M - Cont. gate rehab & CCC seepage barrier
- Dover Dam (Dam Safety) $2.8M - Complete/closeout project
- L&D 2, 3 & 4 Monongahela River (NAV) $9.0M - Cont. S&A on Charleroi River Chamber
- KY Lock (NAV) $0 – Active IWTF project
- Olmsted L&D (NAV) $160M - Cont. dam construction.
- Rough River Dam (Major Rehab) $25M – Initiate grout curtain & cutoff wall
- Center Hill (Dam Safety) $53.4M – Comp. dam barrier wall; cont. RCC berm at saddle dam
- Chickamauga Lock (NAV) $0 – Active IWTF project

Navigation ($175M)
Flood Risk Management/Dam Safety ($199M)
Aquatic Ecosystem Restoration ($29M)
## Original IMTS Capital Investment Strategy

### New Construction Program

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>OLMSTED LOCKS AND DAM, OHIO RIVER, IL &amp; KY</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LOCKS AND DAMS 2, 3 AND 4, MONONGAHELA RIVER, PA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHICKAMAUGA LOCK, TN</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>KENTUCKY LOCK ADDITION, TN RIVER, KY</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LD 25 UPPER MISSISSIPPI</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GIWW, HIGH ISLAND TO BRAZOS RIVER, TX</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LAGRANGE - ILLINOIS WATERWAY</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INNER HARBOR NAVIGATION CANAL LOCK, LA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GREENUP LOCKS AND DAM, OHIO RIVER, KY &amp; OH</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LD 22 UPPER MISSISSIPPI</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LD 24 UPPER MISSISSIPPI</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Yellow** indicates continuing construction.
- **Green** indicates construction new start.
THE NEW INFRASTRUCTURE EQUATION:

BENIGN NEGLECT + FISCAL PRESSURES = REAL CONSEQUENCES
2013 Report Card for America’s Infrastructure
by the American Society of Civil Engineers

<table>
<thead>
<tr>
<th>Category</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aviation</td>
<td>D</td>
</tr>
<tr>
<td>Bridges</td>
<td>C+</td>
</tr>
<tr>
<td>Public Parks &amp; Recreation</td>
<td>C-</td>
</tr>
<tr>
<td>Dams</td>
<td>D</td>
</tr>
<tr>
<td>Rail</td>
<td>C+</td>
</tr>
<tr>
<td>Drinking Water</td>
<td>D</td>
</tr>
<tr>
<td>Roads</td>
<td>D</td>
</tr>
<tr>
<td>Energy</td>
<td>D+</td>
</tr>
<tr>
<td>Schools</td>
<td>D</td>
</tr>
<tr>
<td>Hazardous Waste</td>
<td>D</td>
</tr>
<tr>
<td>Solid Waste</td>
<td>B-</td>
</tr>
<tr>
<td>Inland Waterways</td>
<td>D-</td>
</tr>
<tr>
<td>Transit</td>
<td>D</td>
</tr>
<tr>
<td>Levees</td>
<td>D-</td>
</tr>
<tr>
<td>Wastewater</td>
<td>D</td>
</tr>
</tbody>
</table>

America’s Cumulative G.P.A.
A = Exceptional
B = Good
C = Mediocre
D = Poor
F = Failing

Estimated investment needed by 2020 = $3.6 Trillion
Deteriorating Infrastructure
Navigation Dams
Dam Gates

Deterioration

Rivet heads deteriorated

Gate Roller
Deteriorating Infrastructure

Lockport Canal, Illinois River

Lock and Dam 27, Chain of Rocks Canal, Mississippi River
Deteriorating Infrastructure
Deteriorating Infrastructure
Challenge

**Problem**

+ **Deteriorating Infrastructure**
  - Average lock & dam is 59 years old
  - Average dam is 55 years old
  - CDFs approaching capacity
  - 80% of all breakwater structures over 50 years old

+ **Inability to Rehabilitate**
  - IWTF: Lack of cost share funds
  - Loss of buying power – inflation, cost of living, etc.

+ **Growing Backlog of Maintenance**
  - $260M per year deferred maintenance
  - $500M navigation dam maintenance requirement
  - Soo Lock Asset Renewal - $100M over 6 years

+ **Growing Requirements**
  - $300M miter gate replacement program need
  - $200M in Great Lakes dredging requirements

+ **Flat or Declining O&M Budget**

**Options**

A. Operations or Maintenance

B. Recapitalization or maintenance

C. Bring new project on-line or not

D. Apply new Standards or not

E. Increase Budget or not

F. Implement National Asset Mgmt or not

G. Maintain or divest of Infrastructure

H. Dredge Ports or not

---

**O&M Crisis**
Influences on Future Civil Works Program Funding

- **Continuing Resolution:** Limits new study and new construction starts (current CR through 11 Dec 2014)
- **No Earmarks:** Limits Congressional Adds and plus-up to Pres Bud (Funding Pots)
- **Sequestration / Budget Cuts:** Tied to reducing National Debt
- **Inland Waterways Trust Fund:** Construction funds limited to revenues
- **National/Regional Priorities:** Infrastructure investments that strengthen the national economy, security & quality of life (Value to Nation)
- **Event-Driven Supplemental Appropriations:** Storm/Hurricane Flood Damages
- **CW Budget Transformation:** Moving from “Project-centric” to a prioritized “systems-based, watershed approach”
- **OMB and ASA(CW) Policy:** Constrained budget ceilings, Investments must support national economic and environmental goals
- **Water Resources Reform and Development Act of 2014 (WRRDA 2014):** Currently awaiting HQUSACE implementation guidance
- **Local Sponsor/Stakeholder Partnerships:** Cost Sharing, P3 initiatives
The Future of Inland Navigation
Marine Highway Corridors

**Authority**

- Authorized by an Act of Congress - 2007
- Established the U.S. Department of Transportation Office of Marine Highway and Passenger Services
- Designating state-level Maritime Coordinators

**Impact to USACE**

- Potential increase in container usage = Increase value to the Nation
- Heightens the O&M requirements to ensure reliable lock and dam system
- Increased predictability of the inland navigation system
- New users/stakeholders to the system

---

**A Call to Action**

- Global Supply Chain moves in 20’ and 40’ International Shipping Containers
- Economic Development
- Increase Export potential
- Sustainability

**WAY AHEAD**

- Memorandum of Agreement in place between the U.S. Department of the Army and the U.S. Department of Transportation, Maritime Administration
- Establish peer to peer partnerships between USACE/MARAD
- National Navigation Forecast Model that reports both tonnage and value
## The Future of Inland Navigation

### Why Inland Navigation
- Freight railroad capacity constraints
- Highway congestion
- Driver Issues
  - Shorter pedal times
  - Driver shortage
- Fiscally constrained budgets
- Inland Navigation system has capacity

### An Economy in Transition
- Increasing Global trade
- Growing World export volumes
- More container ports globally
- Ever increase demand and throughput of US Container ports
- US International Gateway Ports do not have room to grow

### Marine Highways – LRD
- M-71/77 Lake Erie/Ontario/ST Lawrence Seaway
- M-96 Lake Michigan
- M-90 Lake Superior/Huron
- M-55 Illinois River
- M-70 Ohio, Mississippi, Missouri Rivers
- M-65 Cumberland, Tennessee-Tombigbee Waterway

### WAY AHEAD
- Next Generation Inland Navigation Vessel Design
- Container on Vessel
- Increased Public/Public Partnerships
- New Economic Modeling and Forecasting
- Public/Private Partnerships to assist with start up COV services
United States relative to other nations

Low investment in infrastructure!
(equivalent to Greece #143 in world)

Since 2000: more than a doubling in delays!

These are actual delays experienced by vessels!

Effects of decreased investment

US Army Corps of Engineers: Navigation Lock Unavailability

Since 2000:
- ~50% decrease in availability
- Twofold increase in scheduled outages!
Influence of Infrastructure Investment on GDP and Jobs

Increasing US infrastructure investment can raise annual GDP by up to $320 billion and create 1.8 million jobs.

Annual incremental GDP by 2020

<table>
<thead>
<tr>
<th>Sector</th>
<th>Increase in Jobs</th>
<th>Increase in GDP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>1.1 million–</td>
<td>85–100</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>1.3 million</td>
<td>25–30</td>
</tr>
<tr>
<td>Services</td>
<td></td>
<td>85–95</td>
</tr>
<tr>
<td>Trade, transport, and logistics</td>
<td></td>
<td>20–40</td>
</tr>
<tr>
<td>Other sectors</td>
<td></td>
<td>45–55</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1.5 million–</strong></td>
<td><strong>270–320</strong></td>
</tr>
</tbody>
</table>

Added investment in infrastructure could yield, by 2020...

**Addition of:**
- **up to 1.8 Million Jobs!**
- **up to $320B to GDP**

---

1. Includes financial, legal, and professional services; management, health care, and education; and leisure and hospitality.
2. Includes real estate; agriculture and forestry; mining; and government.

SOURCE: US Bureau of Economic Analysis; American Society of Civil Engineers; McKinsey Global Institute analysis
Real-World Impacts

What’s at risk?
By 2020 we could lose:

• $270 billion in U.S. exports
• $697 billion in GDP
• 738,000 jobs annually
• $872 billion in personal income.

2012 Drought

MV Regina Maersk

Lock and Dam 27, Chain of Rocks Canal, Mississippi River
The United States: Most problematic factors for doing business

Inadequate SUPPLY of Infrastructure is PRESENTLY of low concern to most international survey respondents.
Gross Fixed Investment (Public & Private Sectors): United States Relative to Other Nations

Figure: GDP Per Capita versus Gross Fixed Investment as a % of GDP: Underinvestment in the US

At 13% of GDP, US is one of the lowest in the world. All following the 2008 recession...

One Step Ahead of Greece!
EMERGING GAME CHANGERS:

FOUR UPHEAVALS
Upheaval #1: Explosive Growth in US Agricultural Productivity

- 15-25 bushels per acre growing to 100 bushels per acre
  - Wheat, rice, soybeans, cotton
- Growing to 200 bushel per acre – corn
  - Some cases 300 bushels per acre
- Second “Green Revolution” now
  - First – 1970s “Borlaug” Revolution
Upheaval #2: Hydrocarbon Production Revolution

- United States oil production:
  - Grew 18% in last year alone
  - US will be world #1 producer in 2015 (more than KSA)  US is #1 producer July 2014

- United States natural gas production:
  - United States is world’s #1 producer as of 2013 (more than Russia)

- Affects many other industries including chemical, plastics and all manufacturing

[Maps showing gas production in conventional fields and shale gas plays, Lower 48 States]
Upheaval #3: Return of Manufacturing to the United States


Construction began Jul 2014 on $1.1 billion steel mill
U.S. Trade Projected to More than Double
2008 - 2028

Millions of TEUs

Imports
Exports
Total

Source: I H S G I World Trade Service
Ever Larger Containerships

- **Pre-1970**
  - 1,700 TEU
  - <10 Containers Wide

- **1970-1980**
  - 2,305 TEU
  - 10-11 Containers Wide

- **1985**
  - 3,220 TEU
  - 11-13 Containers Wide

- **1986-2000**
  - 4,848 TEU
  - 13-17 Containers Wide

- **2000-2005**
  - 8,600+ TEU
  - 17-22 Containers Wide

---

**Existing locks’ maximum vessel:** 4,800 TEU

**New locks’ maximum vessel size:** 12,600 TEU
“Megaship” Fleet on the Rise

![Graph showing the increase in the number of vessels from 2000 to 2030.](image)

**Source:** MSI

**Figure 16:** Historical and Forecast Fully Cellular Container by TEU Band 2000-2030
President’s “We Can’t Wait” Initiative
Advancing key infrastructure projects at 5 East Coast ports:
• NY / NJ
• Charleston
• Savannah
• Jacksonville
• Miami
U.S. Ports and Inland Waterways: Vital to our National Economy

2 Billion Tons of domestic and import/export cargo annually
# The Future of Inland Navigation

## Marine Highway Corridors

### Authority
- Authorized by an Act of Congress - 2007
- Established the U.S. Department of Transportation Office of Marine Highway and Passenger Services
- Designating state-level Maritime Coordinators

### Impact to USACE
- Potential increase in container usage = Increase value to the Nation
- Heightens the O&M requirements to ensure reliable lock and dam system
- Increased predictability of the inland navigation system
- New users/stakeholders to the system

### A Call to Action
- Global Supply Chain moves in 20’ and 40’ International Shipping Containers
- Economic Development
- Increase Export potential
- Sustainability

### WAY AHEAD
- Memorandum of Agreement in place between the U.S. Department of the Army and the U.S. Department of Transportation, Maritime Administration
- Establish peer to peer partnerships between USACE/MARAD
- National Navigation Forecast Model that reports both tonnage and value
# The Future of Inland Navigation

## Why Inland Navigation
- Freight railroad capacity constraints
- Highway congestion
- Driver Issues
  - Shorter pedal times
  - Driver shortage
- Fiscally constrained budgets
- Inland Navigation system has capacity

## An Economy in Transition
- Increasing Global trade
- Growing World export volumes
- More container ports globally
- Ever increase demand and throughput of US Container ports
- US International Gateway Ports do not have room to grow

## Marine Highways – LRD
- M-71/77 Lake Erie/Ontario/ST Lawrence Seaway
- M-96 Lake Michigan
- M-90 Lake Superior/Huron
- M-55 Illinois River
- M-70 Ohio, Mississippi, Missouri Rivers
- M-65 Cumberland, Tennessee-Tombigbee Waterway

## WAY AHEAD
- Next Generation Inland Navigation Vessel Design
- Container on Vessel
- Increased Public/Public Partnerships
- New Economic Modeling and Forecasting
- Public/Private Partnerships to assist with start up COV services
Upheaval #4: Accelerating Impacts from Climate Change

- Changes to weather
  - Precipitation more intense – more volume in less time
  - Increased runoff from this and development
  - Significant storm events of high intensity
    - Record number of > $1 billion events in 2013 (41 - 7 in United States)
    - Increasing high damage weather events - 151 since 1980
**Global Temperature and Carbon Dioxide**

*Graphic courtesy of NOAA Paleoclimatology, National Climatic Data Center*

---

**Measurements of Surface Temperature and Sun’s Energy**

The full record of satellite measurements of the sun’s energy received at the top of the Earth’s atmosphere is shown in red, following its natural 11-year cycle of small ups and downs, without any net increase. Over the same period, global temperature relative to 1961-1990 average (shown in blue) has risen markedly. This is a clear indication that changes in the sun are not responsible for the observed warming over recent decades. (Figure source: NOAA NCDC / CICS-NC).

---

Climate Change Impacts in the United States: Highlights, U.S. Global Change Research Program, p. 23

http://nca2014.globalchange.gov/highlights
Accelerating Impacts from Climate Change - Damage Trends


Katrina Diaspora

This map illustrates the national scope of the dispersion of displaced people from Hurricane Katrina. It shows the location by zip code of the 800,000 displaced Louisiana residents who requested federal emergency assistance. The evacuees ended up dispersed across the entire nation. Illustrating the wide-ranging impacts that can flow from extreme weather events, such as those that are projected to increase in frequency and/or intensity as climate continues to change. (Figure source: Kent, 2008).
Proposed Program Strategy

• Look at various replacement options
  ► Do Nothing - gates continue to deteriorate. Over $43B losses in 20 yrs
  ► Replacements per Technical Recommendations - average annual cost is $31.6 million. Completed in 2023
  ► 20 yr replacement program - up to $25 million/yr
  ► Replacements in Construction (Major Rehab) – shifts from O&M to Construction. Cost shared 50-50 w/Inland Waterways Trust Fund

• Move toward optimal and affordable plan

Contact:
William R. Chapman III, P.E., (513) 684-6211

Questions