The State of U.S. Infrastructure - Past, Present and Future

Society of American Military Engineers
Regional Joint Engineer Training Symposium

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

6 November 2014, Portland, OR
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
A Dream is **Just a Dream** ...

A **Goal** is a Dream with a **Plan** and a **Schedule**

Douglas Peabody, 1959-2012

“One of the **great mistakes** is to **judge** policies and programs by their **intentions** rather than their **results**.”

Milton Friedman
Changing Perspectives on Infrastructure

Hierarchy of Public Works Needs

Wear and Tear
Disabling

Resilience & Recapitalization

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

United States

Other Emerging Powers

Investments
Enabling

Nation Building

Economic Efficiency

Environmental Enlightenment (Post Affluent)

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

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

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Less than 25% of the population experienced the building of our nation’s key infrastructure
1a) Nation Building: Starting the Task

Analysis
• 1808 Gallatin Report

Key Legislation
• 1826 Omnibus Rivers and Harbors Act
• 1862 Homestead 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
1b) Nation Building: Completing the Phase

Key Legislation
- 1902 Reclamation Act
- 1917 Flood Control Act (first)
- 1920 Federal Water Power Act
- 1927 Rivers and Harbors Act
- 1928 Boulder Canyon Project Act

Institutions Formed
- 1902 Reclamation Service
- 1905 National Forest Service
- 1909 National Conservation Cmsn
- 1912 National Waterways Commission
- 1916 National Park Service
- 1920 Federal Power Commission

Key Events
- 1914 Panama Canal completed
- 1927 Great Mississippi River Flood
2a) Economic Efficiency: Harnessing Nature

Analysis
• 1933 National Planning Board multi-purpose plans for ten rivers
• 1936 Flood Control act with benefit-cost language
• 1942 Gilbert White’s analysis of human adjustments to floods

Key Legislation
• 1928, 1936 & 1938 Flood Control Acts

Institutions Formed
• 1933 Tennessee Valley Authority
• 1933 National Planning Board
• 1935 National Resources Committee
• 1939 Bureau of the Budget
• 1939 Public Works Administration
• 1916 National Park Service
• 1940 National Fish and Wildlife Service

"Floods are an act of God, but flood losses are largely an act of man“
Gilbert White
2b) Economic Efficiency: System Build-out

Analysis
• 1952 Circular A-47 Economic Analysis
• 1958 Multiple-Purpose River Development
• 1962 Design of Water Resources Systems

Key Legislation
• 1944, 1956, 1965 Flood Control Act
• 1948 and 1956 Water Pollution Control Acts
• 1955 and 1965 Rivers and Harbors Act
• 1956 Federal Aid Highway (Interstate) Act
• 1965 Water Resources Planning Act
• 1966 Clean Rivers Restoration Act
• 1968 Wild and Scenic Rivers Act
• 1968 Flood Insurance Act

Institutions Formed
• 1950 Presidential Water Resources Policy Cmsn
• 1952 House Subcommittee to Study Civil Works
• 1955 Pres. Cmsn on Water Resources Policy
• 1958 NASA
• 1965 Water Resources Council
The Power of Leadership and Vision

“It is because we have undertaken this gigantic task that will take us more than a generation to complete, because we have undertaken it now, and the people of the United States understand the objective of the idea, that I feel very certain we are going to carry it through to a successful completion.”

- President Franklin Delano Roosevelt, at Fort Peck Dam, 1934
3) Environmental Enlightenment: Late 1900s

Analysis
- 1962 “Silent Spring” published
- 1973 National Water Commission report

Key Legislation
- 1969 National Environmental Policy Act
- 1973 Endangered Species Act
- 1977 Clean Water Act
- 1980 CERCLA
- 1986 Federal Power Act
- 1986 Water Resources Development Act

Institutions Formed
- 1970 Council on Environmental Quality
- 1970 Environmental Protection Agency

Key Events
- 1969 Cuyahoga River Catches Fire
- 1986 FEMA takes over Interagency Flood Management Task Force
- 1989 Escalating Federal involvement in Everglades restoration
4) Emerging Focus?
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
“And I'm very interested in pursuing ideas that can put folks to work right now on roads and bridges and waterways and ports and a better air traffic control system. If we had one, by the way, we could reduce delays by about 30 percent. We could reduce fuel costs for airlines by about 30 percent, and hopefully that would translate into cheaper airline tickets, which I know everybody would be interested in.

So there's all kinds of work we can do on our infrastructure. This may be one mechanism that Republicans are comfortable in -- in financing those kinds of efforts. So, that will be part of the discussion that I think we're prepared for on Friday, and then in the weeks to come leading into the new Congress.”

Barack Obama,
5 November 2014
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.
Some “Inevitable” Empires

- British Empire
- Ottoman Empire
- Roman Empire
- Charlemagne
- Napoleon’s French Empire
- Philip of Macedon
- Ming Dynasty
- Aztec Empire
- Soviet Union
### 2013 Report Card for America’s Infrastructure

*by the American Society of Civil Engineers*

<table>
<thead>
<tr>
<th>Category</th>
<th>Grade</th>
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<tbody>
<tr>
<td>Aviation</td>
<td>D</td>
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<tr>
<td>Bridges</td>
<td>C+</td>
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<tr>
<td>Ports</td>
<td>C</td>
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<tr>
<td>Public Parks &amp; Recreation</td>
<td>C-</td>
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<tr>
<td>Dams</td>
<td>D</td>
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<tr>
<td>Rail</td>
<td>C+</td>
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<tr>
<td>Drinking Water</td>
<td>D</td>
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<tr>
<td>Roads</td>
<td>D</td>
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<tr>
<td>Energy</td>
<td>D+</td>
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<tr>
<td>Schools</td>
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<tr>
<td>Hazardous Waste</td>
<td>D</td>
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<td>Solid Waste</td>
<td>B-</td>
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<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>
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</tbody>
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America’s Cumulative G.P.A.

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

**Estimated investment needed by 2020 = $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

1. Hong Kong 6.7
2. Singapore 6.5
3. Germany 6.4
4. France 6.3
5. Switzerland 6.2
6. United Kingdom 6.2
7. Netherlands 6.2
8. United Arab Emirates 6.1
9. South Korea 5.9
10. Spain 5.9
11. Japan 5.9
12. Luxembourg 5.8
13. Canada 5.8
14. United States 5.8
15. Austria 5.8

Sector-specific indexes, 2012–13
Out of all 144 countries

- Ports: United States #19
- Roads: United States #20
- Power and telephony: United States #21

SOURCE: World Economic Forum; McKinsey Global Institute analysis
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.
Historical Investments by USACE Functional Category 1928 to 2011

Billions of FY 2011 Dollars

Year

$0 $2 $4 $6 $8 $10 $12

~$70.00 per person in the US!

~$56.00 per person in the US!

~$18.00 per person in the US!

Capacity Building


Functional Category: Navigation, Flood, Multipurpose, MR&T, Dredging
Long Term Civil Works Funding Trends

Appropriation ($Million in 2012 $)

- O&M
- Constr
- Invest
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.
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></td>
<td>$0.03</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:
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.
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
Trends Influencing CW’s Future

- **Aging infrastructure**: Critical need for robust asset management & a long-term recapitalization program
- **Domestic discretionary funding**: Need for innovative financing, capital stock divestment, market-based solutions
- **Globalization**: Waterborne trade implications, homeland security & international water resources, expansion of Panama Canal
- **Political and Governance turmoil**: No focus on America’s infrastructure needs and investment
- **Water resources challenges:**
  - Lack of a national water resources Vision to elevate water infrastructure to a national level of attention
  - Need IWRM perspective to holistic solutions, collaborative planning
  - Competition for water, including increasing environmental & water supply needs
  - Climate change adaptation & water-food-energy nexus
- **USACE organization**: Performance, technical capability, delivery
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
- We lack emphasis on the importance of quality assurance and quality products
- In a budget constrained era, we must do what it takes to Be RELEVANT!!
- All of which adds up to …
USACE Civil Works
Construction Backlog

Backlog of Congressionally Authorized Projects by Business Line

- **Environmental Infrastructure**: 5%
- **Navigation - Ports**: 20%
- **Navigation Inland**: 5%
- **Shore Protection**: 10%
- **Flood Damage Reduction**: 35%

Billions

- $0
- $10
- $20
- $30
- $40
- $50
- $60
- $70

- $2 billion
- $60 billion

Construction Funds (annual) vs. USACE Backlog

BUILDING STRONG®
Transforming Civil Works

Deliver enduring & essential water resource solutions by applying effective transformation strategies.
Planning Modernization

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

The Pentagon was planned in only 5 days and completed in 18 months. We would do remarkably well to replicate such conception-to-completion time today.
Construction of the Washington Monument began in 1848 but stopped when funds ran out 6 years later. It resumed 25 years later, but had to use a different stone source, thus the change in color partway up the shaft. Budget Development Transformation seeks to prevent similar stop-and-start construction.

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

- Operationalize integrated water resource management by Water Informed Budget Execution
- Expand watershed-informed pilots to include a majority of our projects
- Engage stakeholders to identify opportunities investment priorities
- Standardize business process that utilize watershed approaches
Delivering Quality Solutions & Services

Solutions and services are delivered effectively, efficiently, sustainably.

- Keep our commitments – Deliver 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 quality technical solutions (leverage CX’s and Review Processes)
- Restore, protect, and manage our aquatic resources
- Develop and implement a climate preparedness and resilience roadmap
- Complete regulatory decisions faster

USACE built the Pension Building after the Civil War to provide space for the 1,500 people involved in providing pension coverage for veterans and for their survivors. Today that building is the National Building Museum, a testament to the quality of its design and construction – and a reminder of “quality solutions and services” that can be seen from the COE’s office window.
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 identify public-private partnership (P3) projects
- Coordinated systems (within watershed) based investment decisions – apply WRRDA and make divestiture decisions

McMillan Reservoir, completed in 1902, is part of the water supply system begun by USACE before the Civil War. It continues to provide most of the city’s water today.
Investment Strategy: Public-Private Partnership Possibilities

- Recreation
- Hydropower
- Harbors
- Flood Risk Management
- Disaster Recovery

Leveraging *Private and Other Agency Capital*
Hydropower Partnerships

- 1937 - Congress creates Bonneville Power Administration (BPA) in 1937 to market and transmit power produced at Bonneville Dam.


- 1994, 1998 - BPA and Department of Army sign MOUs.
Recreation Partnerships

Habitat Construction at Table Rock Lake

Corps Partnership with Bass Pro Shops

USACE returns $50M generated in user fees to US Treasury each year

USACE Recreation Areas welcome 370 million visitors annually
Conclusion

• **USACE’s Civil Works mission provides a key foundational component of the Nation’s public infrastructure that facilitates economic growth, quality of life, environmental health and national security for the American people!**

**BUT…**

• CW infrastructure is deteriorating (declining engineering condition).
• CW infrastructure is underperforming (declining service performance).
• U.S. is under-investing in its public works infrastructure overall.
• U.S. lags other developed nations in maintenance of prior public infrastructure investments.
• We stand to squander the international competitive advantage provided by the Nation’s public works due to inattention to the needs of aging infrastructure, shifting demand, climate change, and underinvestment.
• At risk is U.S.’s economic prosperity, quality of life & environmental health.
• **USACE CW infrastructure is on unsustainable glide-path of benign neglect.**
• We are devolving from a paradigm of “preventing failure”, to one of “fixing after failure”, and even towards “failing to fix!”
What Can You Do?

- **Tell the Story** - Preach Infrastructure’s Value to Nation
- **Leverage** Efforts
- **Collaborate** with ALL stakeholders and beneficiaries
- **Find consensus** for major initiatives
- **Identify** funding to reach outcomes
- **Be mutually supportive**
- **Involve & engage** end-users
- **Seek to influence** decision-makers
- **Facilitate a** Watershed-Informed approach
- **Help the Nation** prioritize efforts, programs, and projects
- **Support innovative approaches for** alternative resourcing
Thank You!
WRRDA 2014

- Water Supply and Reservoirs
- Regulatory) (including 408)
- Dam Safety
- Levee Safety
- Non-Federal Implementation
- Credits

Deauthorizations & Backlog Prevention

Alternative Financing

Navigation

Project Development and Delivery (Including Planning):
Water Resources Reform & Development Act

Non-Federal Partnerships

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.

- Corps authorized to enter into agreements with non-federal interests, including private entities, to finance at least 15 water projects.
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/ProjectPlanning/legislativelinks.aspx.
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 during plan formulation.

► Replace culture of completing a study, then distributing for stakeholder/public comment only after USACE (with sponsor) has developed the recommended plan.
Collaboration in CW Transformation

- SMART Planning
  - Facilitation skills are key to charettes
  - How to involve others in compressed schedule?

- Watershed-informed-Budgeting
  - Stakeholder Engagement helps identify full value of USACE investments

- Collaboration will be key in developing public-private partnerships
What Do We Expect in Collaboration?

• Tell the Story - Preach 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!
Sustainable Rivers Project

- Partnership between Corps of Engineers and The Nature Conservancy on ecosystem restoration
- More than a decade of collaboration
- Project types include:
  - adaptive reservoir management
  - stream restoration
  - wetland restoration
  - river-floodplain reconnection
  - coastal wetland restoration
  - oyster bed restoration
  - dam removal
WestFAST

- 2008 Western Governors’ ‘Next Steps’ report suggested formation of a federal team to assist the coordination and implementation of the recommendations of the report
- WestFAST is a collaboration of 11 Federal agencies with water management interests in the West

Key areas of interest for the WSWC and WestFAST:
- Water Planning, Water Resources, and Infrastructure
- Climate Variability
- Drought
- Water Quality
- Indian Water Rights Issues
- Endangered Species
- Energy and Water

WestFAST’s work plan is available at:
http://www.westgov.org/wswc/westfast/workplan/index.htm
Water management (and water reform) is ALWAYS political.....

Ancient Chinese Characters:

River + Dike = Political Order
But Today...

USACE Capital Stock presently yields $87.05 BILLION PER YEAR in realized NED benefits!

Potential Impact on “Public Benefits”

- Missed opportunities for:
  - Additional job creation
  - National and regional economic growth
  - Improved intermodal freight transportation logistics & reduced consumer prices
  - Increased exports and imports
  - Reduced flood vulnerability to life & property
  - Improved hydro-electric energy generation
  - Flexible provision of water supply
  - Enhanced fish and wildlife habitat & restored wetlands
  - Sustaining the availability of outdoor recreation

- Reduced contributions to legacy U.S.:
  - Standard of living
  - Economic prosperity
  - Quality of life
  - Environmental health
  - National security and defense