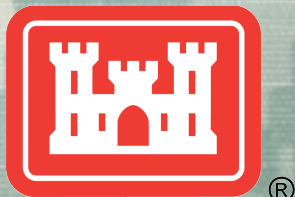


# Transforming the Corps Civil Works Program in a Changing Environment

*Presentation to  
Association of Metropolitan Water Agencies  
Washington, DC  
7 April 2014*

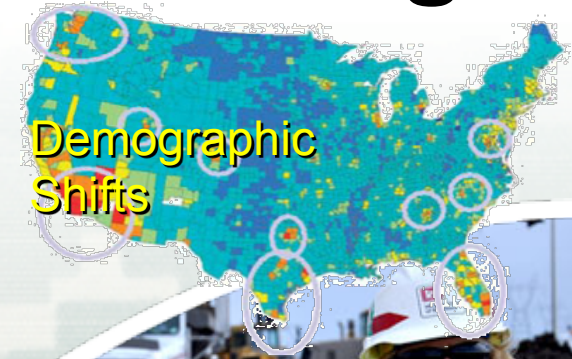
*Steven L. Stockton, P.E.  
Director of Civil Works  
U.S. Army Corps of Engineers*



US Army Corps of Engineers  
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# National Water Resource Challenges

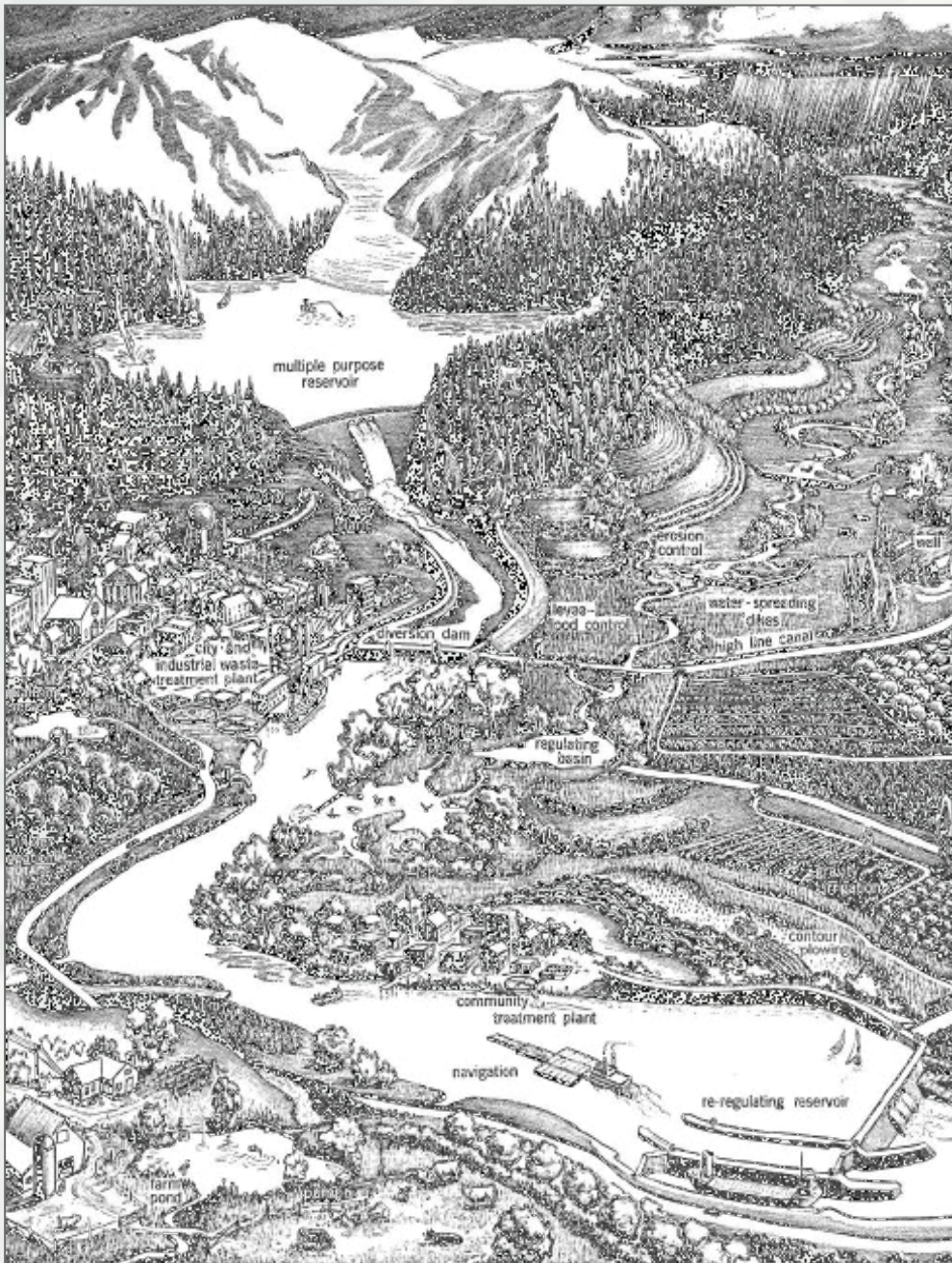


# Value of Past Investments

An illustration of the relationship between services yielded by ecosystems, infrastructure, and the economic activities they support.

The value of natural and constructed systems was viewed as being greater than the sum of their intertwined parts, not only for the present generations, but also for those that would follow.

From: "A Multiple-Purpose River Basin Development", *A Water Policy for the American People The Report for the President's Water Resources Policy Commission (1950)*



# The Cost of Failure to Invest... New Orleans Before and After

## Pre-Katrina "System" 2005

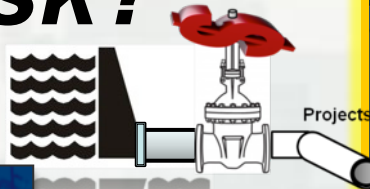
- 50% complete after 50 years
- \$130 B in Recovery Costs
  - 1500 Lives Lost

## \$14B Post-Katrina System

- Designed and Constructed in 6 years
- Successfully Performed during Hurricane Isaac



# What is at risk?



**FAILURE TO ACT  
THE IMPACT OF  
CURRENT INFRASTRUCTURE  
INVESTMENT ON AMERICA'S  
ECONOMIC FUTURE ★★★★★**

**USACE Capital Stock presently yields  
\$48.8 BILLION PER YEAR in realized  
NED benefits!**

2013 REPORT CARD FOR AMERICA'S INFRASTRUCTURE ASCE

Navigation Menu

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## AMERICA'S INFRASTRUCTURE G.P.A. D-

Each category was evaluated on the basis of capacity, condition, funding, future need, operation and maintenance, public safety and resilience. Methodology

Aviation	D	Ports	C
Bridges	C+	Public Parks and Recreation	C-
Dams	D	Rail	C+
Drinking Water	D	Roads	D
Energy	D+	Schools	D
Hazardous Waste	D	Solid Waste	B-
Inland Waterways	D-	Transit	D
Levees	D-	Wastewater	D

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

ESTIMATED INVESTMENT NEEDED BY 2020:  
**\$3.6 TRILLION**

LEARN MORE >

### 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

# Relative Quality of US Infrastructure is Declining

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



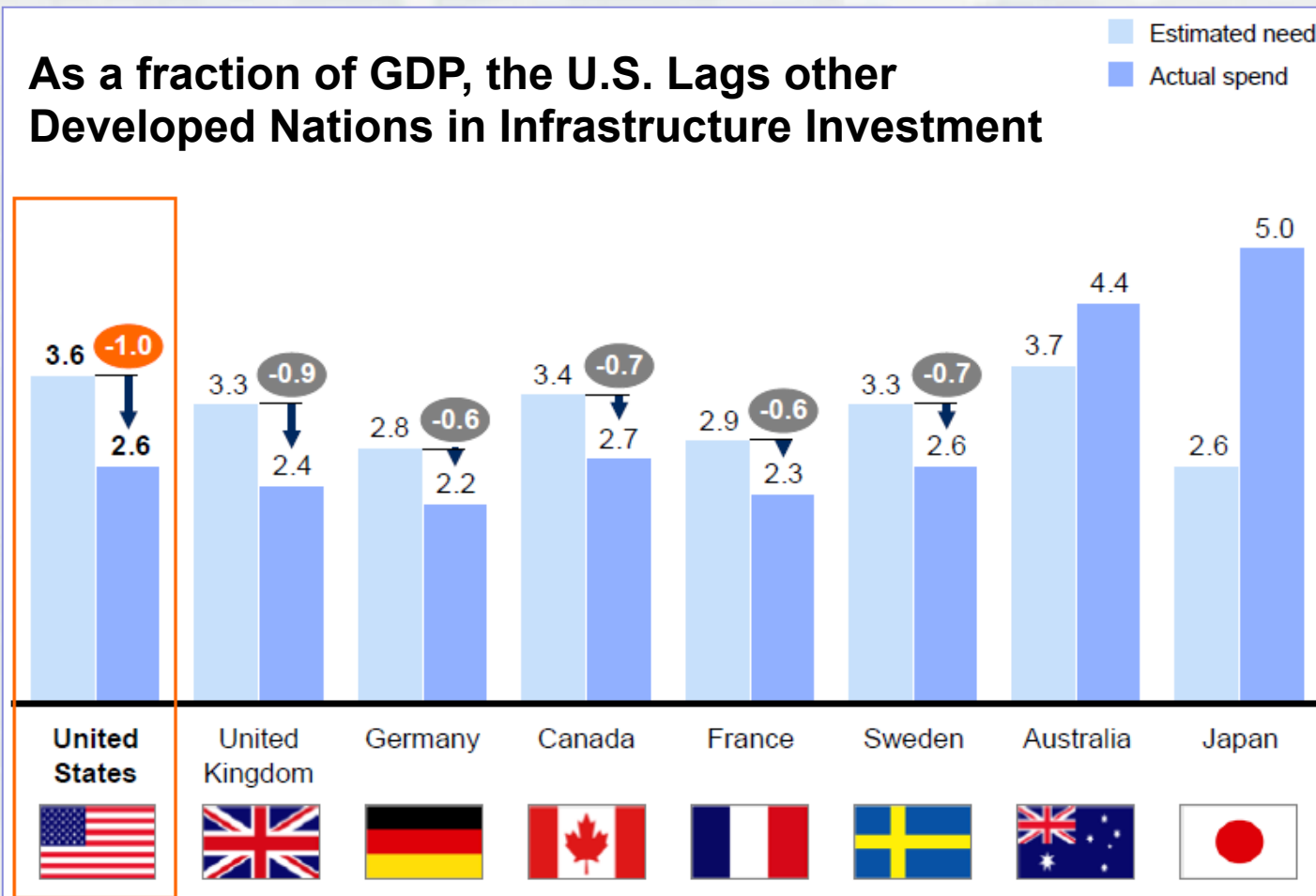
SOURCE: World Economic Forum; McKinsey Global Institute analysis

**U.S. Port Infrastructure not even among the top 15 in World!**



# Patterns in Global Spending in Infrastructure

As a fraction of GDP, the U.S. Lags other Developed Nations in Infrastructure Investment

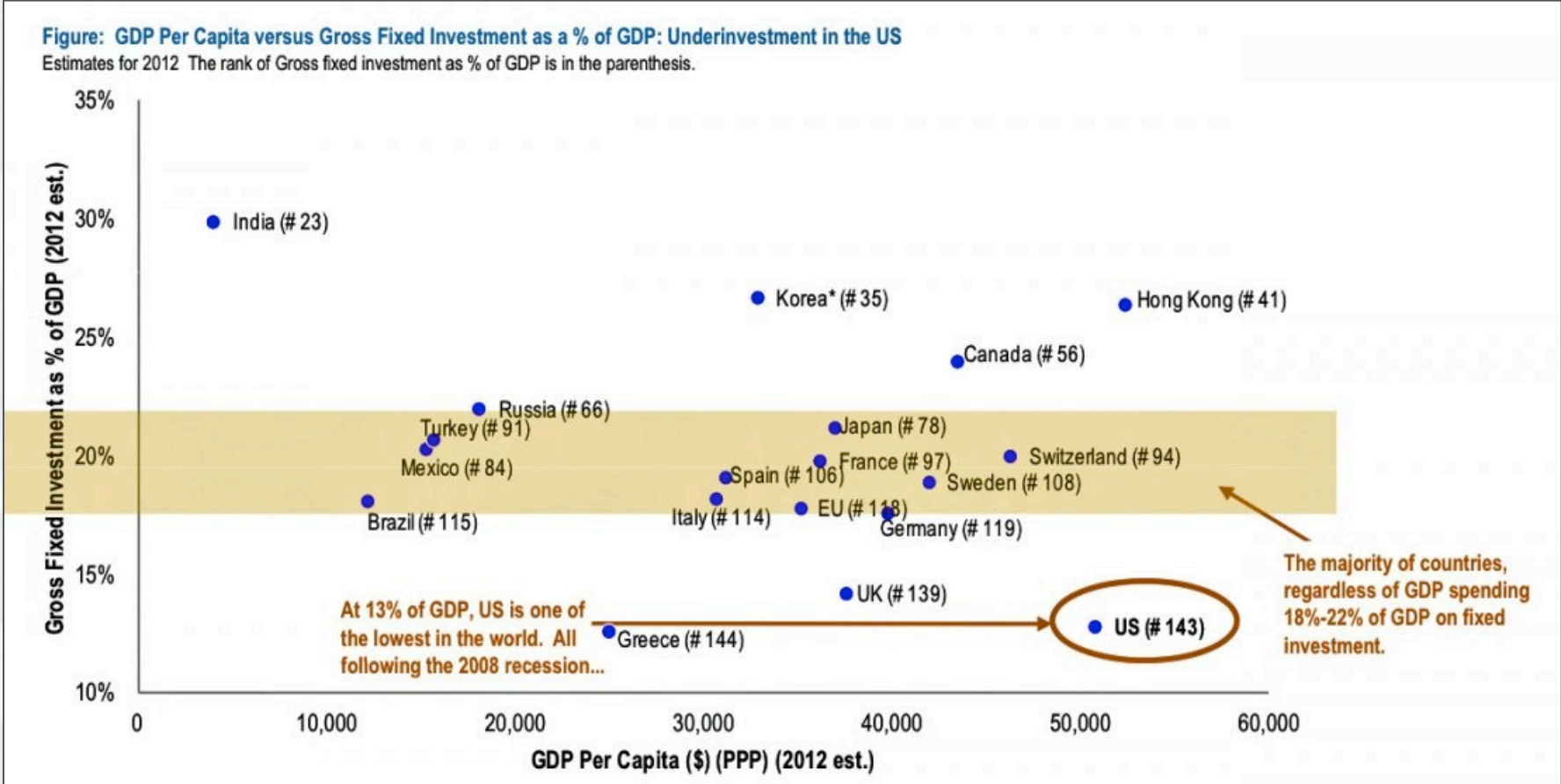


1 Actual spend calculated as weighted average annual expenditure over years of available data, 1992–2011. Estimated need based on projected growth, 2013–30.

SOURCE: McKinsey Global Institute analysis



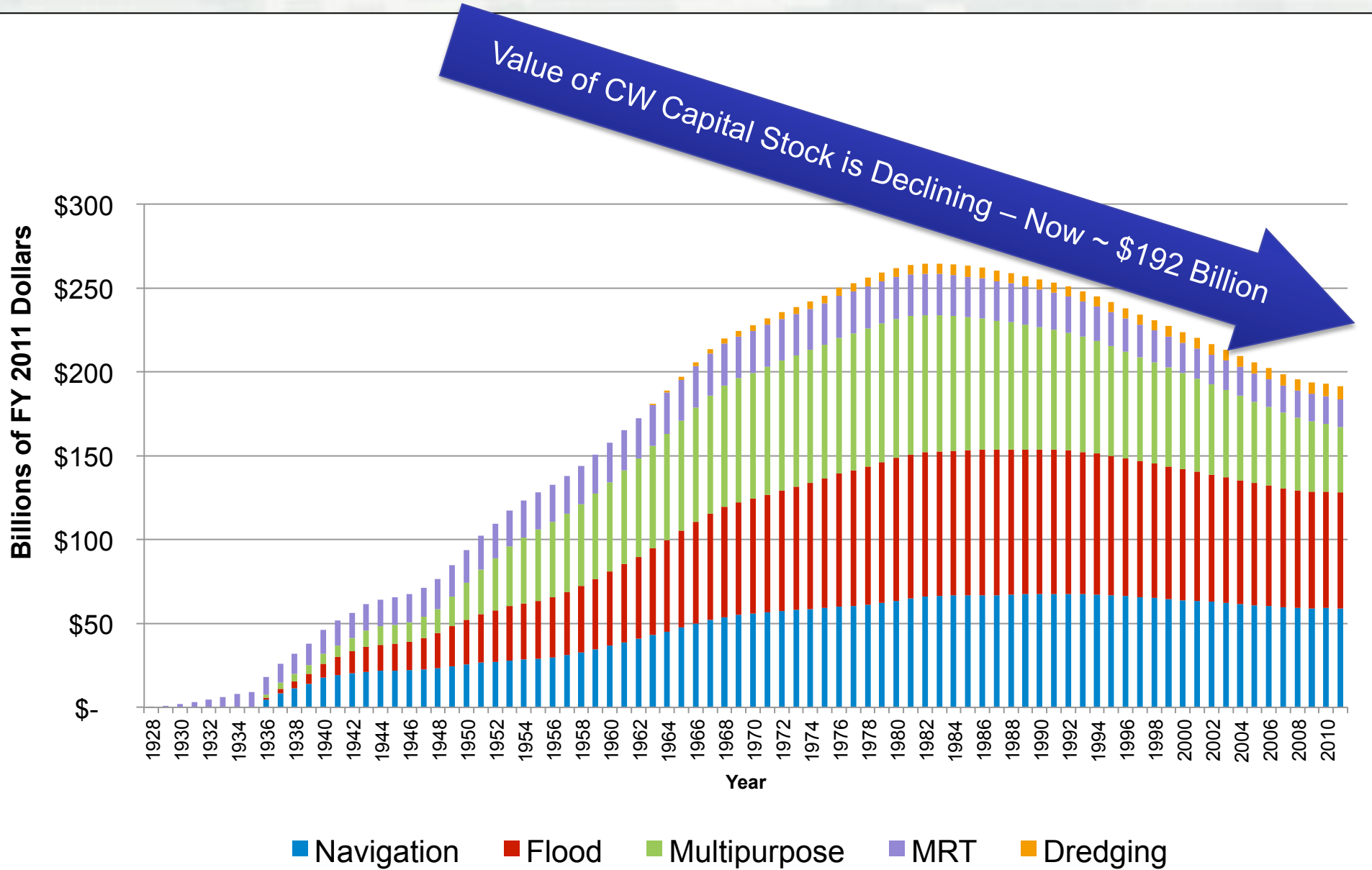
# Gross Fixed Investment (Public & Private Sectors) - United States Relative to Other Nations



**US Has Overall Low Investment in Infrastructure!** (Ranking equivalent to Greece)



# USACE Capital Stock Value by Functional Category 1928 to 2011



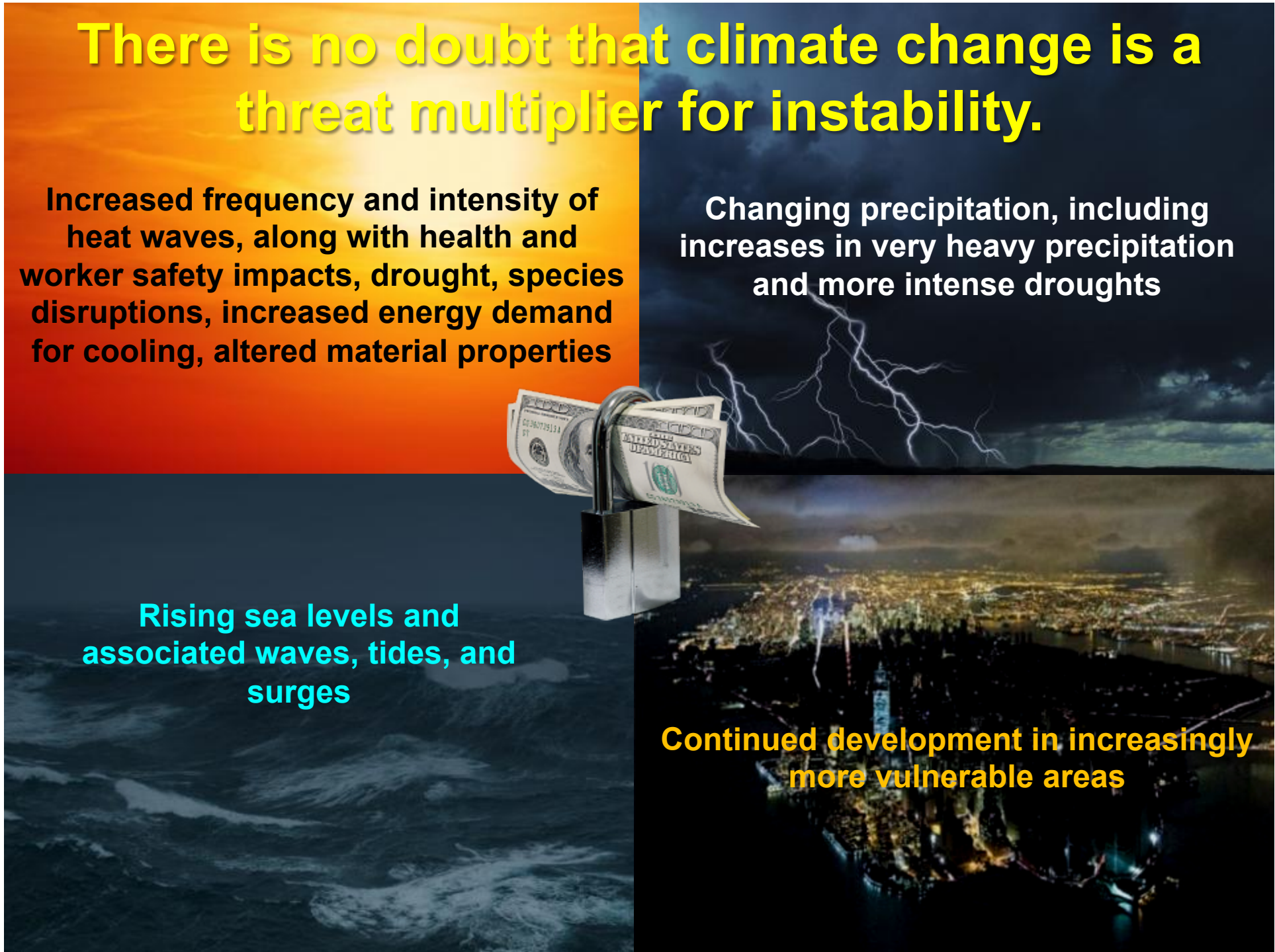
# There is no doubt that climate change is a threat multiplier for instability.

Increased frequency and intensity of heat waves, along with health and worker safety impacts, drought, species disruptions, increased energy demand for cooling, altered material properties

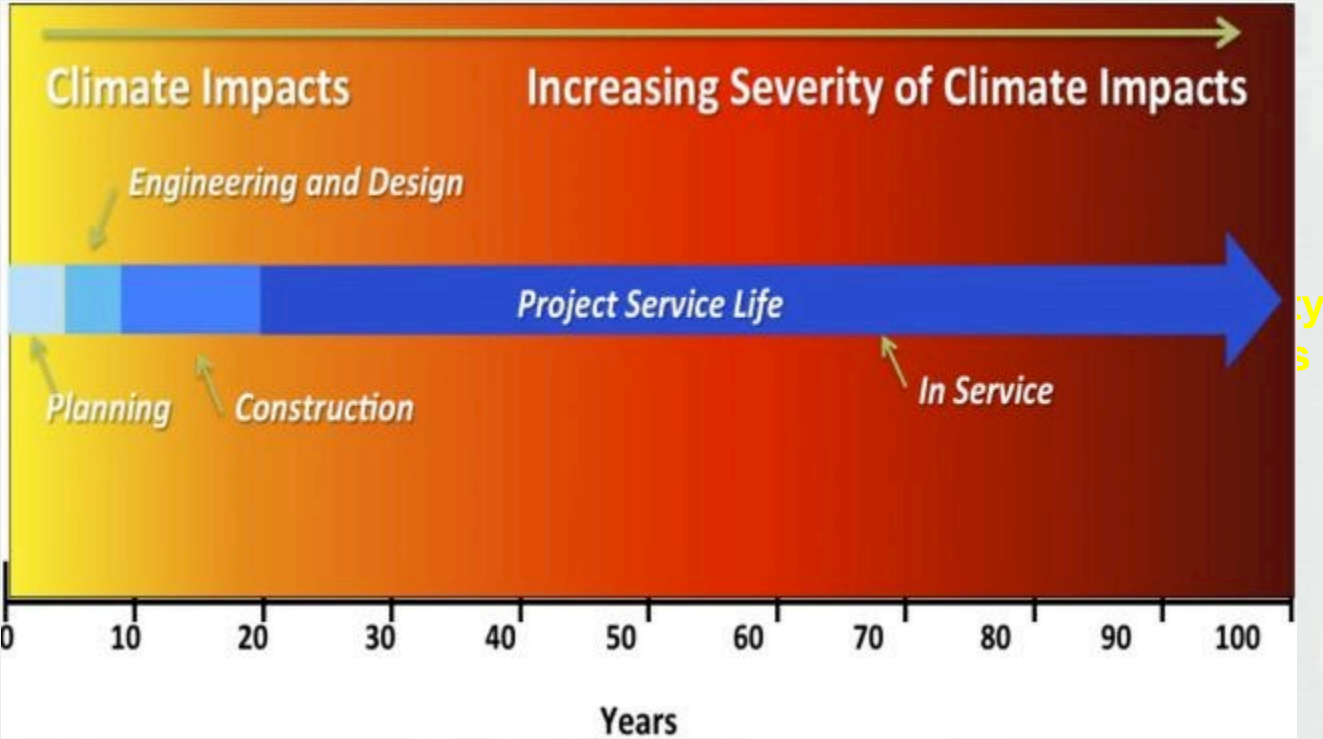
Changing precipitation, including increases in very heavy precipitation and more intense droughts

Rising sea levels and associated waves, tides, and surges

Continued development in increasingly more vulnerable areas



# Water Infrastructure Characterized By Long Service Life



“Today’s **infrastructure investment choices are key**, as they represent a huge opportunity to spend on projects that will result in better, long-term resource management ... A lack of investment now or investment in unsustainable areas will result in further costs through climate change.....” (World Economic Forum 2009)



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# It's Not All About Extreme Events, but Combinations, Too



“Sea level along much of the eastern U.S. was **higher than normal** for much of June and July 2009, enough to cause significant attention from coastal communities because of the lack of coastal storms that normally cause such anomalies....”

“... unique in that the NE winds were not at a multi-year high or the Florida Current transport at its low. But **the coupled effect** of the two forces created SL residuals that were at **highest levels** all along the East Coast.”

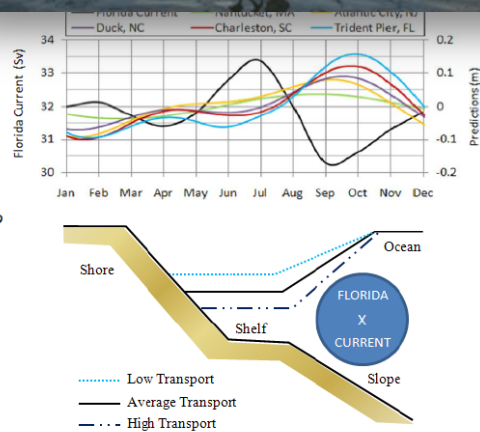
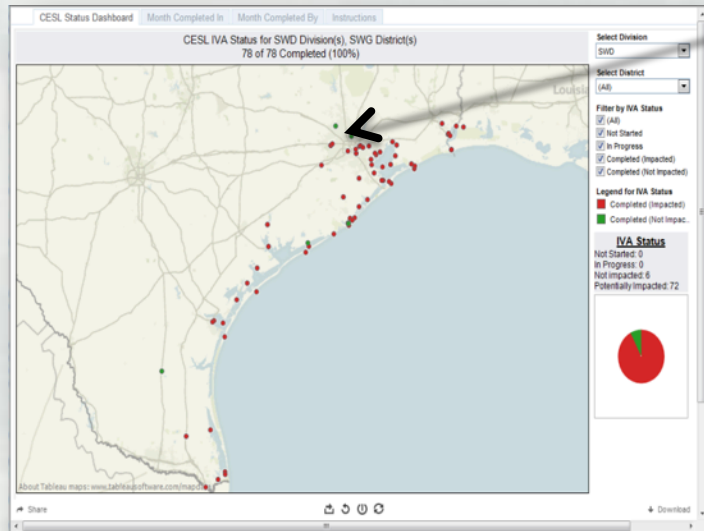


Figure 10. a) The June 2000 – June 2009 average seasonal cycle of FC transport based on a 90-day lowpass filtered series and SL predictions above MSL and b) diagram showing cross-shore sea slope with low, average, and high FC transport (adaption of Figure 2 in Noble and Gelfenbaum, 1992).



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# Assessing Climate Vulnerability



Critical elevation threshold

## CESL Summary Report

### BARKER RESERVOIR - BUFFALO BAYOU AND TRIBUTARIES

#### CORPS PROJECT NOTEBOOK (CPN) INFORMATION

Project Name: BARKER RESERVOIR - BUFFALO BAYOU AND TRIBUTARIES  
 Status: Active  
 Project Type:  
 Project Phase:  
 Business Lines: Flood and Coastal Storm Damage Reduction  
 County: Harris  
 District: Galveston  
 Latitude: +29.77  
 Longitude: -95.64667  
 Distance to Tidally Influenced Water: 17.04 miles

#### CESL INITIAL VULNERABILITY ASSESSMENT (IVA) DATA

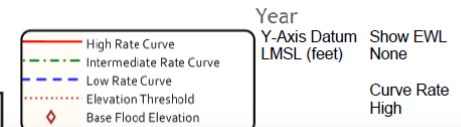
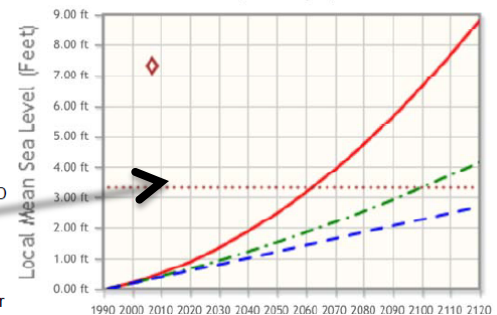
Primary Mission Area : Flood Damage Reduction  
 FEMA Base Flood Elevation : 8 ft. (NAVD88)  
 Elevation Threshold : 4 ft. (NAVD88)  
 Elevation Threshold Data Source : design  
 Description of Elevation Threshold : Invert elevation is at ~62' NAVD 88. Backwater effects during major rainfall events in much smaller amounts will impact operating procedure for reservoir.  
 Local Sponsor Support : Harris County Flood Control District  
 Suggested Priority for More Detailed Study : High  
 Suggested Priority for More Detailed Study Reasoning: Critical infrastructure, major flood damage reduction feature. This Reservoir protects against potential catastrophic flooding in Downtown Houston, and all the major tributaries that discharge into Buffalo Bayou the this Reservoir releases into. Even though unlikely, the repercussions are enormous and should be investigated further. Additionally this reservoir has large recreational features.

#### CESL ANALYSIS RESULTS

Potentially Impacted by SLC : Yes  
 Initial Vulnerability Assessment Status : Completed  
 Impacts Assessment Prioritization Ranking : High (DRAFT)  
 Impacts Assessment Ranking :

#### CONTROLLING TIDAL GAUGE

8771450 - Galveston Pier 21, TX :  
 6.42 (mm/yr)



Suggested Priority for More Detailed Study : High

Suggested Priority for More Detailed Study Reasoning :

Critical infrastructure, major flood damage reduction feature. This Reservoir protects against potential catastrophic flooding in Downtown Houston, and all the major tributaries that discharge into Buffalo Bayou the this Reservoir releases into. Even though unlikely, the repercussions are enormous and should be investigated further. Additionally this reservoir has large recreational features.

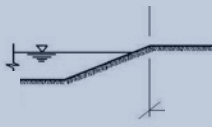


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# ***Risk Informed View of Infrastructure Safety***

$$\text{Risk} = f(\text{Hazard}, \text{Performance}, \text{Consequences})$$

**What are the hazards and how likely are they to occur?**



**How will the infrastructure perform in the face of these hazards?**



**Who and what are in harms way?  
How susceptible to harm are they?  
How much harm is caused?**



Infrastructure Safety Program: Focused on People, Performance, and Risks



# *M&I Water Supply and Irrigation Projects*



[www.vtn.iwr.usace.army.mil](http://www.vtn.iwr.usace.army.mil)  
Water Supply / Fast Facts



# ***Water Supply: Key Points***

- Water rights are the responsibility of states; the Corps does not own or sell water.
- The Corps must operate its reservoir projects in accordance with applicable federal law.
- The Corps itself does not make decisions determining use of water in our reservoirs. We operate according to authorities Congress has given us, other applicable laws, regulations and Executive Orders.
- Water management serves multiple purposes. Congressionally authorized purposes for reservoirs may include navigation, flood damage reduction, water supply, hydropower and recreation.
- Corps has flexibility to accommodate demands of state and local interests for water supply in furtherance, not in conflict, with state water rights.

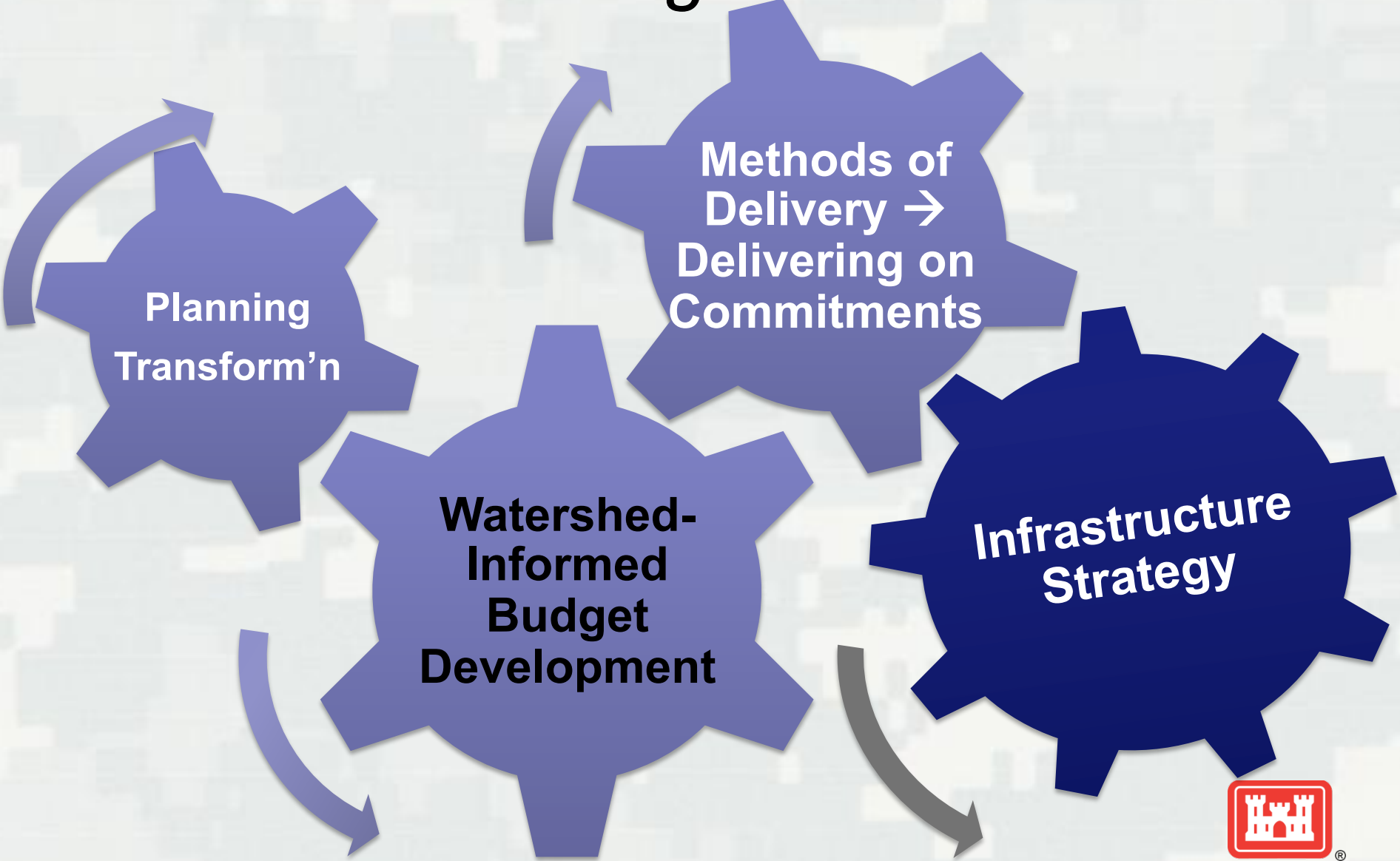


# Corps Water Supply Facts

- Total Capacity of Corps Lakes: 329.2 million acre feet
- Total M & I storage: 9.8 million acre feet
- Projects with M & I storage: 136
  - 25 states & Puerto Rico
  - 335 separate agreements
  - Total investment for M & I storage: \$1.5 billion
  - Balance still owed: \$670 million
  - Typical annual revenue collected - \$40 - \$90 million (varies)
- Percent M & I storage by MSC
  - NAD - 1.7%
  - SAD - 2.2%
  - LRD - 6.3%
  - MVD - 4.6%
  - NWD - 10.4%
  - SPD - 5.8%
  - SWD - 69%
- “Surplus” agreements ~ 20
- Projects with Irrigation storage: 48



# *Transforming Civil Works*



# Planning Modernization

Report of the  
chief of  
engineers U.S.  
army

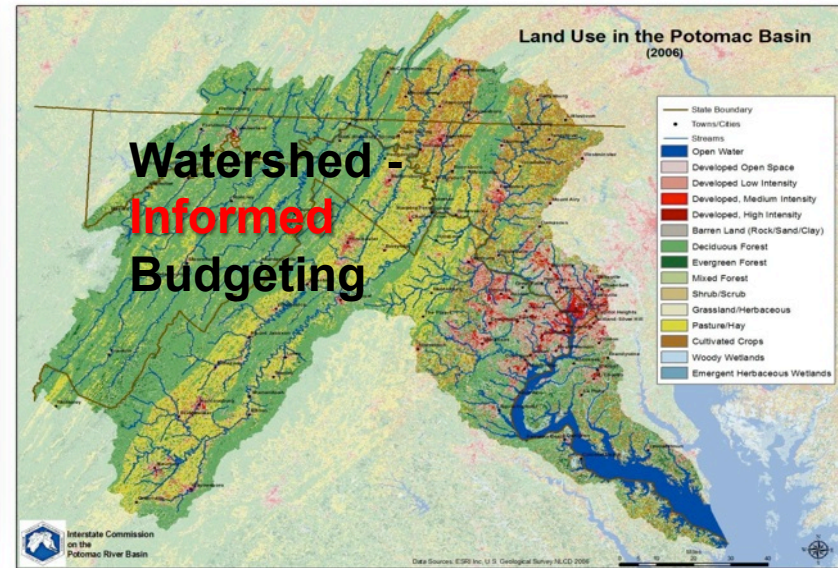
United States  
Army Corps of  
Engineers, ...

- **Determine Federal Interest**
- **Authorization Backlog**
- **Follow-on Work**
- **Portfolio 650 to 158**
- **33 reports=\$28B**

Chief's  
Reports



# Budget Development

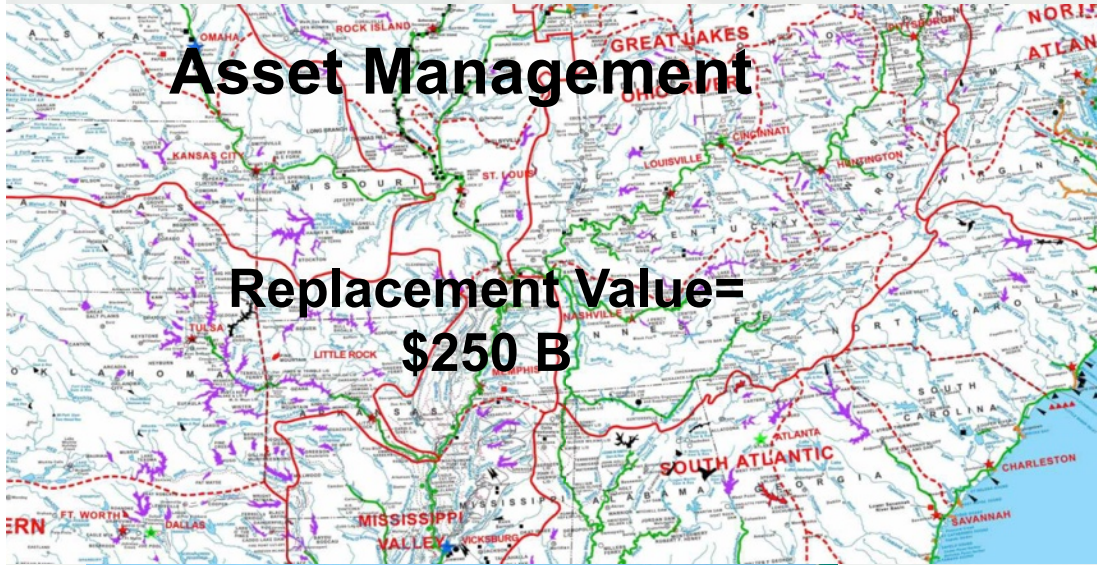


# Methods of Delivery → *Deliver on Commitments*



# Infrastructure Strategy

## Asset Management



## Life Cycle Management



Kentucky River Lock #2, in service since 1839



- Accelerate Execution
- Condition assessments
- Pilots
- Obstacles
- Authorities
- Re-Invent Operations



# Bottom Line

- ***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?

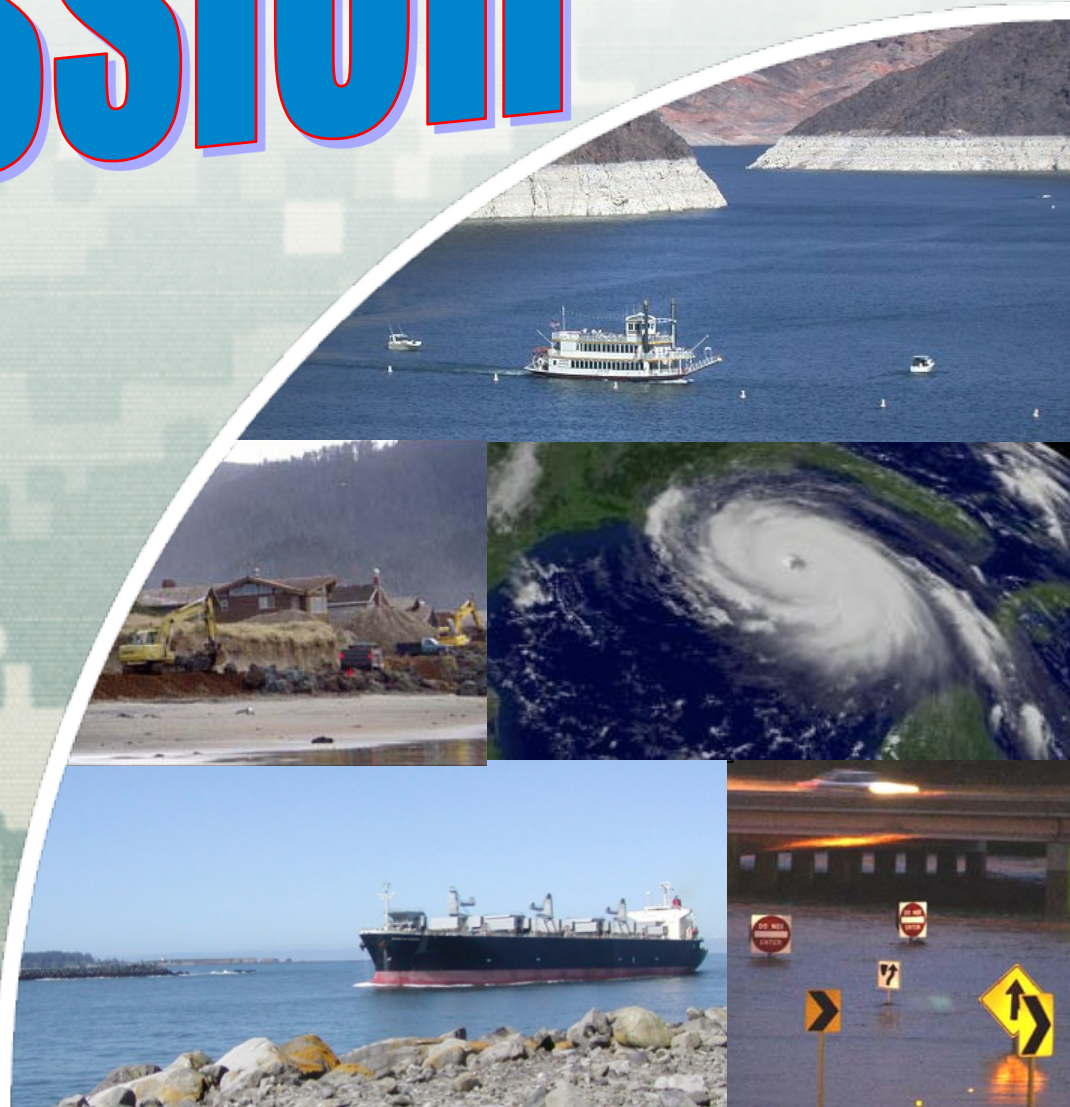
- **Tell the Story** - Preach value of infrastructure to Nation
- Leverage Efforts - **Collaborate** with ALL stakeholders and beneficiaries of the Civil Works Program
- Find **consensus** for major initiatives
  - Identify funding to reach outcomes
  - Engage in dialogue
- Be mutually supportive
- Involve & engage end-users
- Seek to **influence decision-makers**
- Help us **transform Civil Works**
- Facilitate a **watershed-informed** approach
- Help the Nation **prioritize** efforts, programs, and projects
- Support innovative approaches for **alternative resourcing**

# Discussion

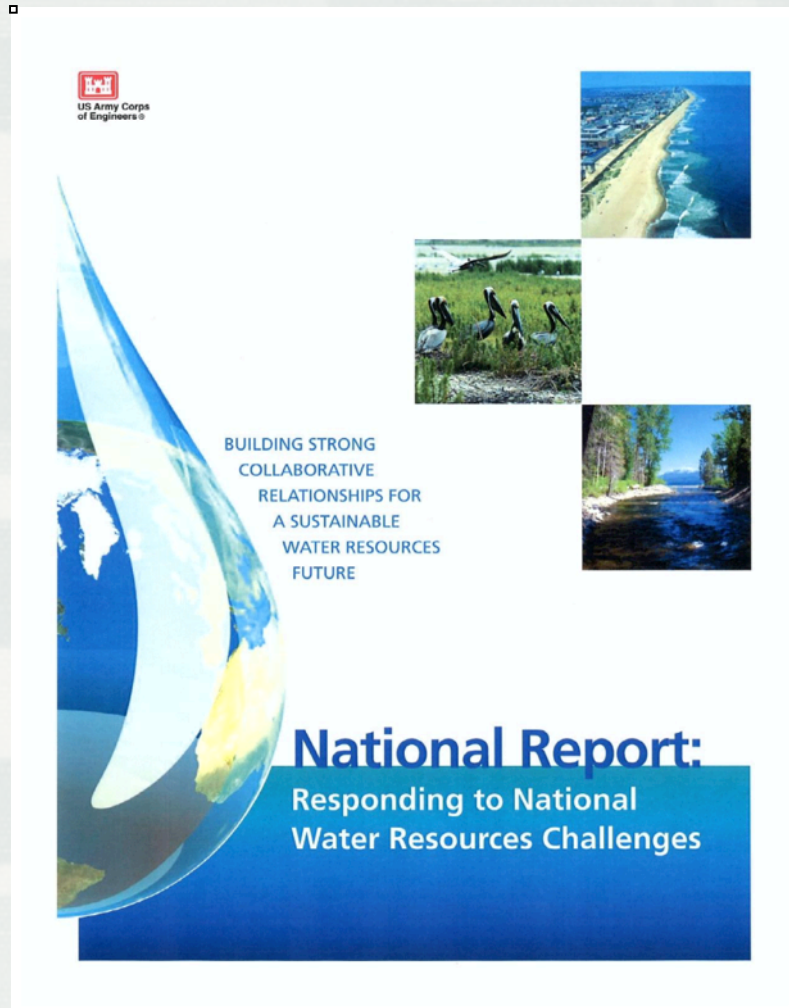


®

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# Approach to a More Sustainable Water Future



- 1) **Integrated Water Resources Management**
- 2) **Governance and Management**
- 3) **Future National Water Resources Direction**
- 4) **Collaboration**
- 5) **Water Resources Investment Strategies**
- 6) **Managing Extreme Events**
- 7) **Knowledge & Technology Transfer**
- 8) **Water Resources Leadership**
- 9) **Communications and Education**



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