

USACE Civil Works Infrastructure: Overview, Challenges and Opportunities

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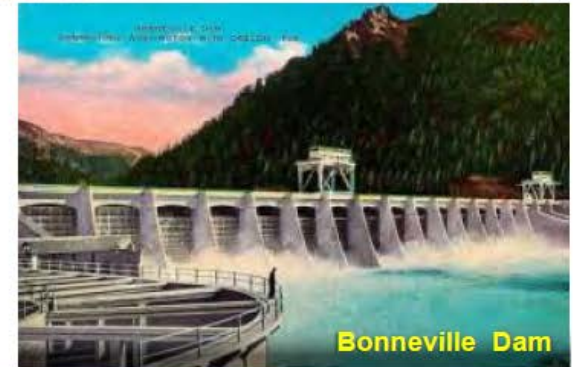


US Army Corps of Engineers
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Corps of Engineers Heritage

241 Years of Service to the Nation



Delivering Civil Works Programs

U.S. Army Corps of Engineers

North Atlantic Division

Great Lakes & Ohio River Division

South Pacific Division

Southwestern Division

Mississippi Valley Division

South Atlantic Division

Pacific Ocean Division

- 2 Engineer Commands
- 9 Divisions
- 43 Districts
- 2 Centers
- ERDC
- ★★
- ★★/★
- ★/★
- ★
- ★

Workforce Size Varies with Workload
Workforce = 821 Military + 33,000 Civilians





Securing Our Nation's Future Through Water



370 + Million Visits Annually
Generate \$18B in Economic
Activity and 500,000 Jobs



2003-2012, Prevented
\$361B in Total Damages



50% of Americans Live
w/in 50 Miles of Coast



404 Lakes / Rivers
in 43 States



20% US Jobs and 1/3 GDP
in Waterborne Commerce

Navigation - Moving Goods to Market

USACE Operates 13,000 miles of Commercial Inland
Waterways; Generates \$18 B / 500,000 Jobs, Annually

Flood and Disaster Risk Reduction

USACE Prevents > \$8 in Flood Damages
for Every \$1 Invested

Hydropower - Inexpensive and Sustainable

USACE is the Nation's Largest Renewable Energy Producer

Drinking Water

USACE Produces 6.5 Billion Gallons per Day

Quality of Life

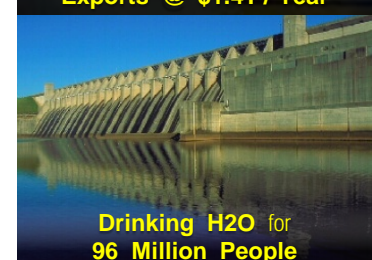
USACE is the No. 1 Federal Provider of Outdoor
Recreation, Contributing > \$16 B to Local Economies



Weather - Related Disasters
3X in Last 30 years



Move 95% US Imports and
Exports @ \$1.4T / Year



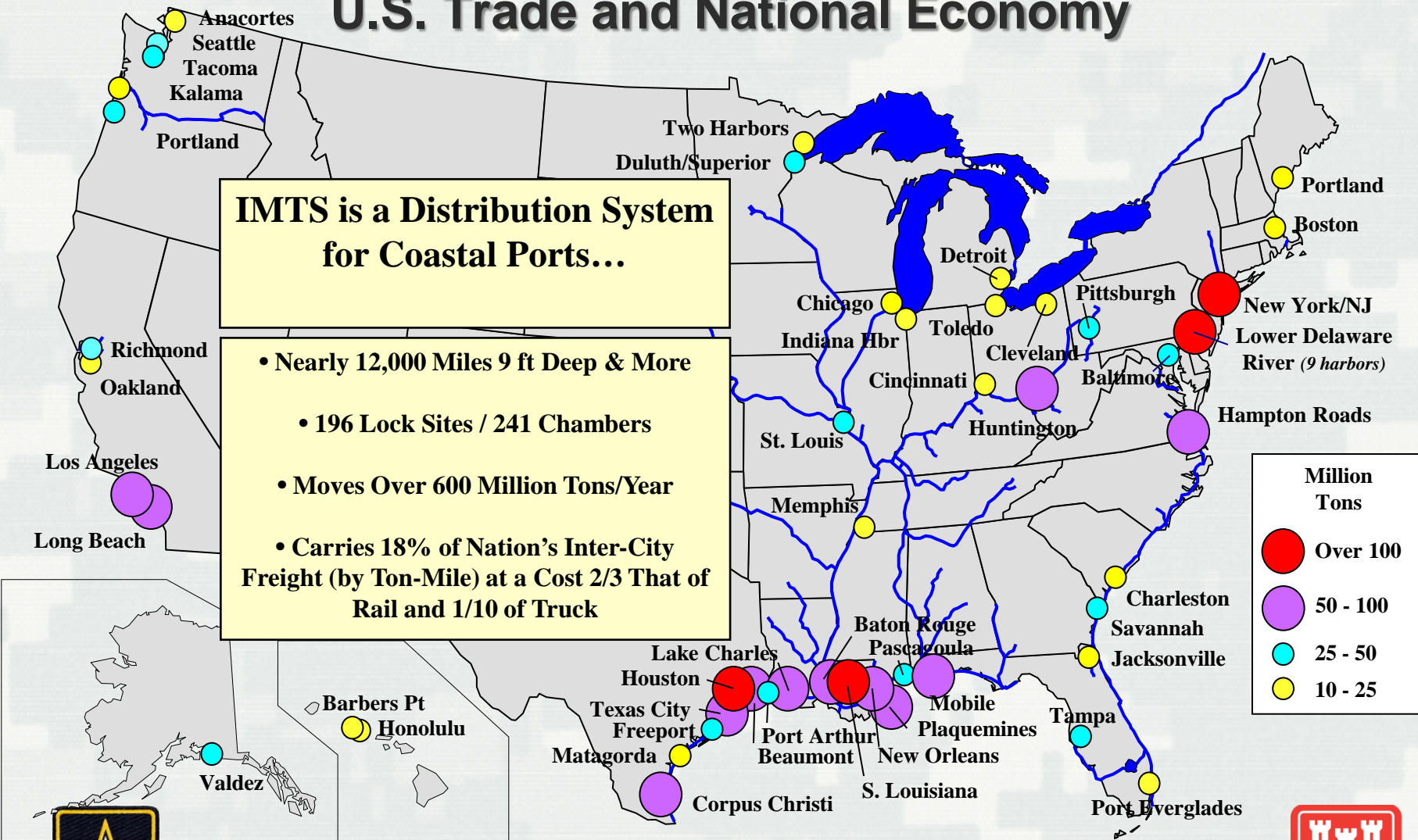
Drinking H2O for
96 Million People



25% US Hydropower and
3% Total US Electricity



The United States Is A Maritime Nation

Inland Marine Transportation System + Ports: Vital to U.S. Trade and National Economy



U.S. Navigation Facts

- 99.6% of U.S. overseas trade volume moves through coastal channels maintained by USACE
- U.S. marine transportation industry supports ~ \$2 trillion in commerce.
- Panama Canal new locks opening in 2016 - Worldwide numbers of post-Panamax vessels to increase
- More than 60% of farm exports move on inland waterways to downstream ports.
- One barge can carry as much freight as 15 rail cars or 58 trucks. This reduces traffic congestion and air pollution.

Vehicle	Capacity	Truck Equivalency
 Barge	1500 Tons 52,500 Bushels 453,600 Gallons	57.7 (865.4 for 15 barges in tow)
 Hopper car	100 Tons 3,500 Bushels 30,240 Gallons	3.8



USACE Navigation System Assets

INLAND NAVIGATION

27 Inland River Systems

228 Lock Chambers @ 186
Lock Sites

12,000 Miles of Inland River
Channels



COASTAL NAVIGATION

1,067 Navigation Projects

13 Lock Chambers

929 Navigation Structures

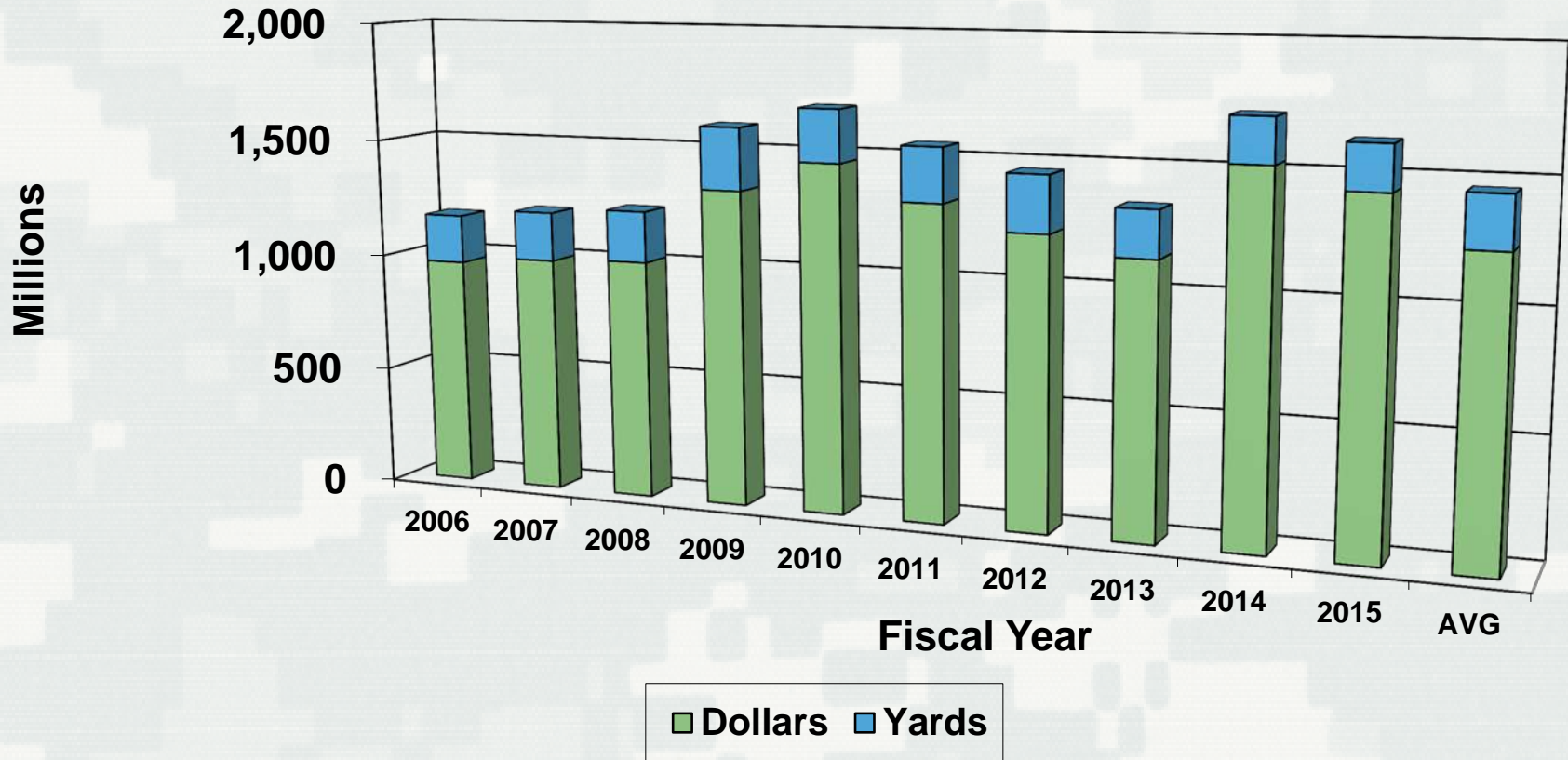
13,000 Miles of Channels

844 Bridges



National Dredging Program Trends

Total Dredging FY 2006-2015



Fiscal Year 2015 Total Dredging: 186 MCY @ \$1,441 Million (\$7.76/CY)

<i>Maintenance Work:</i>	165 MCY (89%) @ \$923 Million (64%)
<i>Hurricane Sandy & Emergency:</i>	13 MCY (7%) @ \$265 million (18%)
<i>New Work:</i>	8 MCY (4%) @ \$253 million (18%)

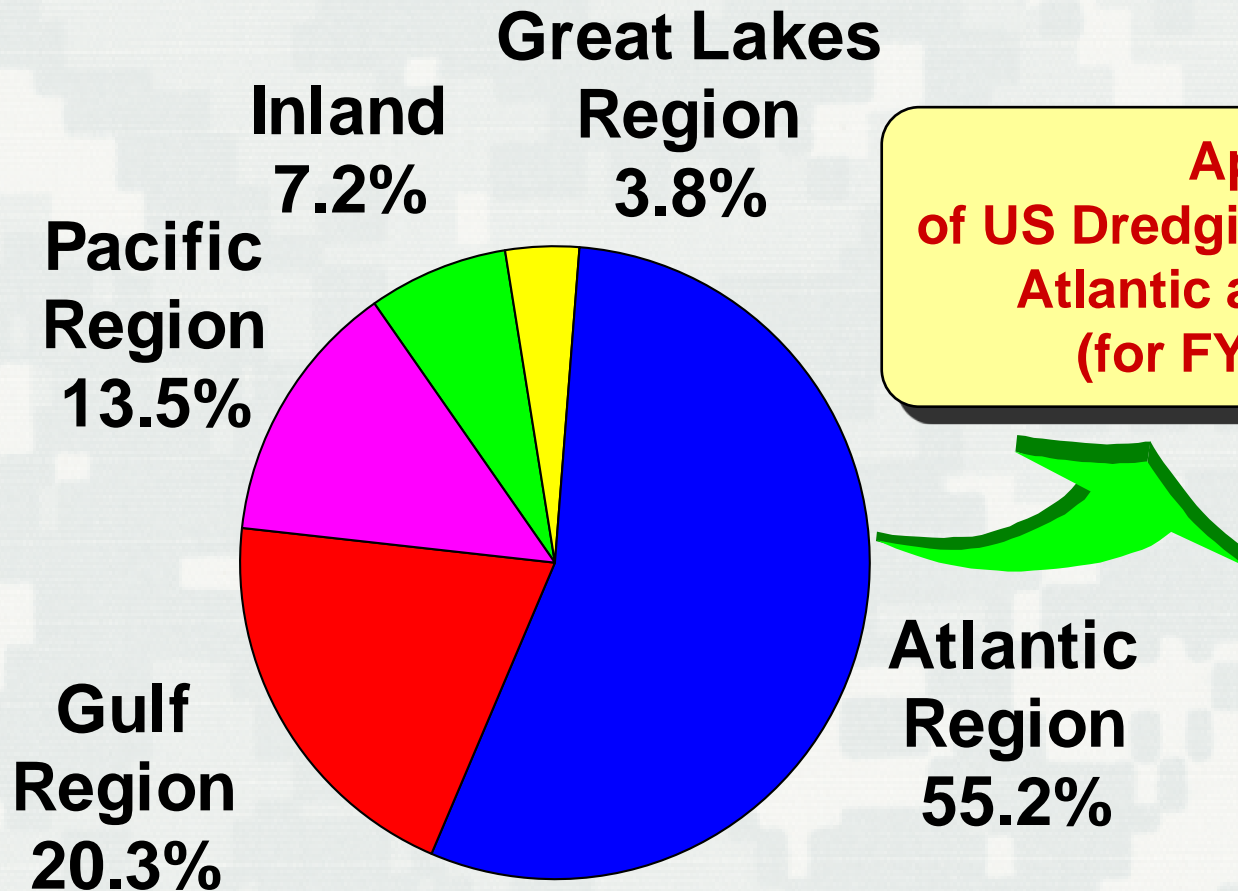


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U.S. Dredging Performance By Region




**Approx 75%
of US Dredging Requirement is in
Atlantic and Gulf Regions
(for FY 15 ~142 MCY)**



Challenges and Opportunities

- **Infrastructure Investment = Global Challenge**
- **Corps Civil Works Portfolio: 3,000+ Operational Projects, with Replacement Value of Approx \$268B**
- **Corps Civil Works Asset Classes are Diverse**
 - Flood & Coastal Storm Damage
 - Coastal and Inland Harbors
 - Inland Waterways
 - Hydropower
 - Dam & Levee Safety Programs
 - Water Storage
 - Aquatic Ecosystems
 - Water-Based Recreation
- **Demands for CW Infrastructure Maintenance, Operations, and Capital Investment are Expanding**
 - Civil Works New Construction Backlog → \$ 60B
 - ASCE: Dams, Levees, IWW's = "D" → \$140B
- **CW Infrastructure Systems Aging, Experiencing Negative Performance Trends Across Portfolio (Serviced by ~\$4.6B Annual Budget Nationally....)**

America's Locks & Dams: A Ticking Time Bomb for Agriculture? 



Inland Waterways

2013
GRADE **D⁻**



Our nation's inland waterways and rivers are the hidden backbone of our freight network – they carry the equivalent of about 51 million truck trips each year . In many cases, the inland waterways system has not been updated since the 1950s, and more than half of the locks are over 50 years old . Barges are stopped for hours each day with unscheduled delays, preventing goods from getting to market and driving up costs. There is an average of 52 service interruptions a day throughout the system. Projects to repair and replace aging locks and dredge channels take decades to approve and complete, exacerbating the problem further.

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

AMERICA'S GPA:
D⁺
GRADING METHODOLOGY



	Add'l Total Investment by 2020	Protects \$B in Exports	Protects \$B in GDP	Protects Jobs	Protects Personal Income
Waterways	\$16B	\$270B	\$697B	738,000	\$872B
Airports	\$39B	\$54B	\$313B	350,000	\$361B
Electricity	\$107B	\$51B	\$496B	529,000	\$656B
Water/Wastewater	\$84B	\$20B	\$416B	669,000	\$541B
Roads	\$846B	\$114B	\$897B	877,000	\$930B

Civil Works Transformation

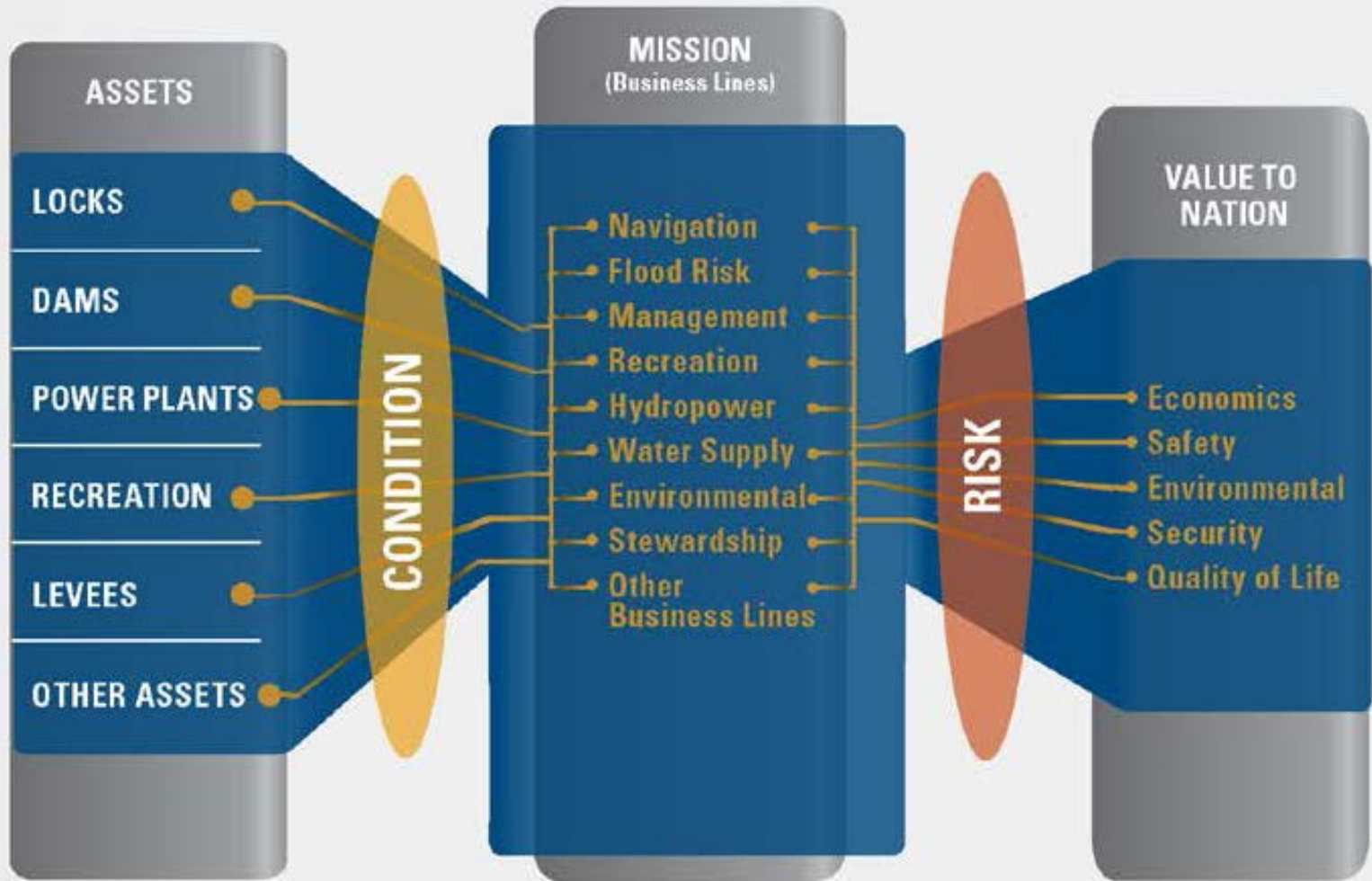
Infrastructure Strategy Components



- **Asset Management:** Assets identification, assessment of conditions/reliability, categorization
- **Life Cycle Portfolio Management:** Ensure future systems' viability through risk assessment and management, funding prioritization in a systems decision making process
- **Alternative Financing:** Identify alternative financing mechanism and options to leverage funding to increase infrastructure investments

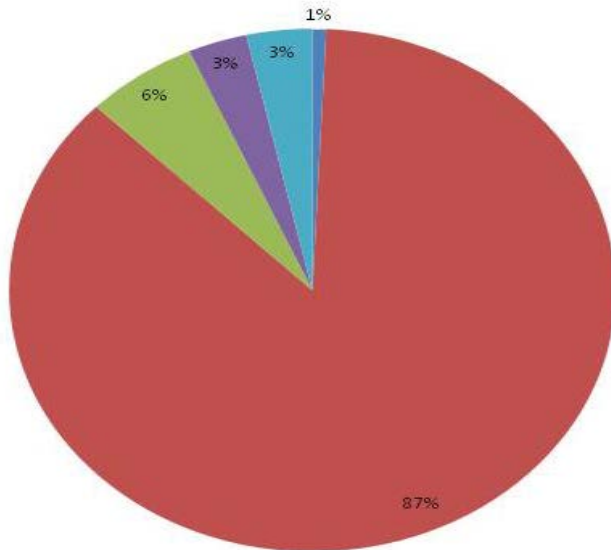


USACE Civil Works Asset Management

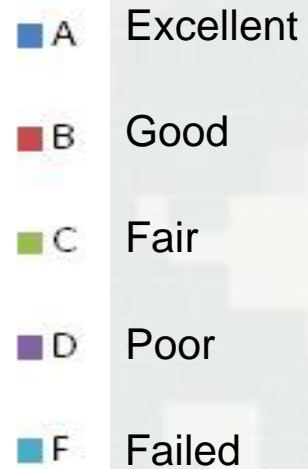
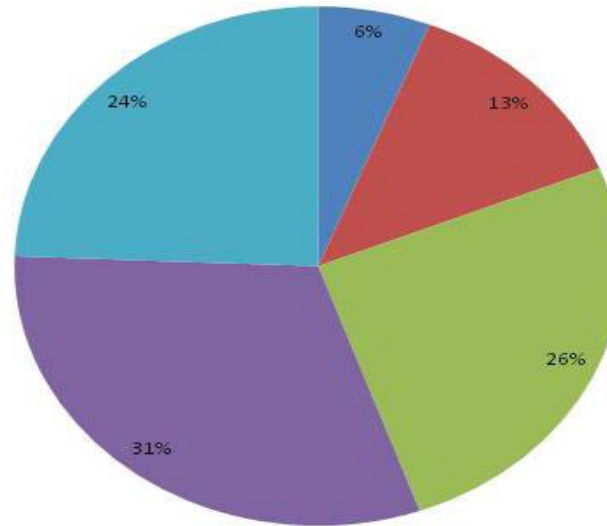


USACE Navigation Portfolio Operational Condition Assessments

Navigation: Lock & Dam Components
Condition Rating Summary



Navigation: Channels
Condition Rating Summary



- USACE OCAs Assess Only Condition as it Impacts Performance
- Poor and Failed Channel Ratings Typically Associated with Low Use WW's
- Poor and Failed Lock and Dam Ratings: Typically Low Use as Well



Condition and Age Alone Are Insufficient

“The advanced age of lock and dam infrastructure is often used to communicate funding needs for the system. **Age is not a good indicator of lock condition.**”

TRB Special Report 315 - Funding and Managing the U.S. Inland Waterways System: What Policy Makers Need to Know (2015)

TABLE 2-5 Summary of Correlations Between Lock Performance and Lock Age in 2014
(Calculated from the Date of Last Known Major Rehabilitation)

River System	Average Age of Locks	Level of Correlation Between Lock Performance and Effective Age on a River System						
		Lockages	Percent of Vessels Delayed	Percent of Tows Delayed	Average Vessel Delay	Average Tow Delay	Average Closure Duration	Closure Frequency
All inland river locks	61	Low	Low	Low	Low	Low	Low	Low
Ohio River	35	Low	Low	Low	Low	Low	Low	Low
Mississippi River	25	Low	Low	Low	Low	Low	Medium	Low
Illinois River	22	Medium	Low	Low	Low	Low	Medium	Medium
Columbia–Snake Rivers	45	Low	Low	Low	Low	Low	High	Low
GIWW	72	Low	Low	Low	Low	Low	Low	Low
Arkansas River	45	Low	Medium	Medium	Medium	Low	Low	Low
Black Warrior, Tennessee, Tennessee–Tombigbee, Tombigbee	42	Low	Medium	Medium	Low	Low	Low	Medium
Monongahela River	57	Medium	High	High	Medium	Low	Gaps in data	Medium
Allegheny River	62	Low	Low	Low	Low	Low	Gaps in data	Low

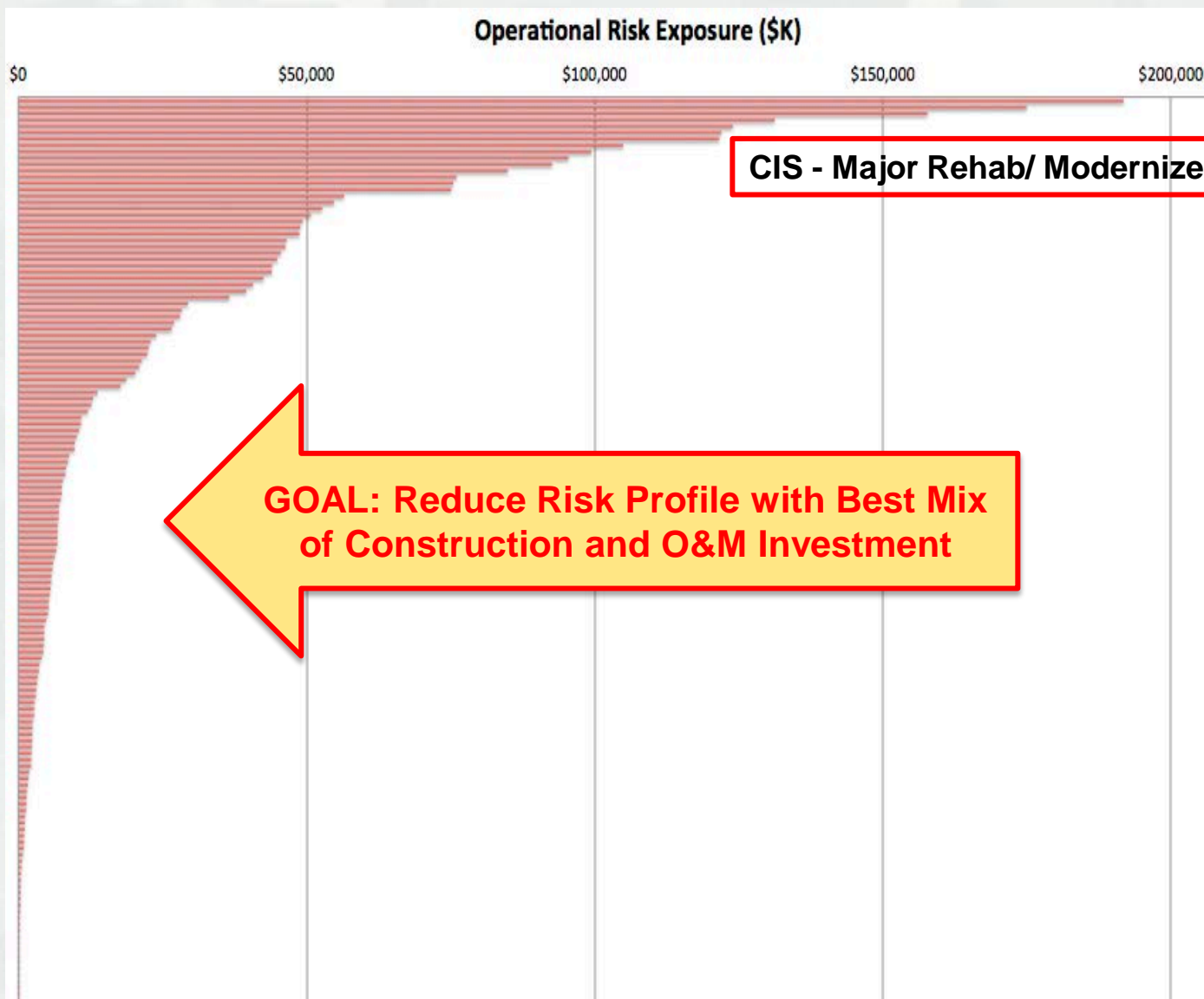
Negative Correlation Positive Correlation

- “Aging” is Code for **Declining Performance**
- Better to Focus on **Risk to Performance**



Navigation Lock & Dam Portfolio Risk Profile

National Portfolio (Approx 200 Projects)



O&M – Minimal PM, Recurring and Minor Corrective Maintenance

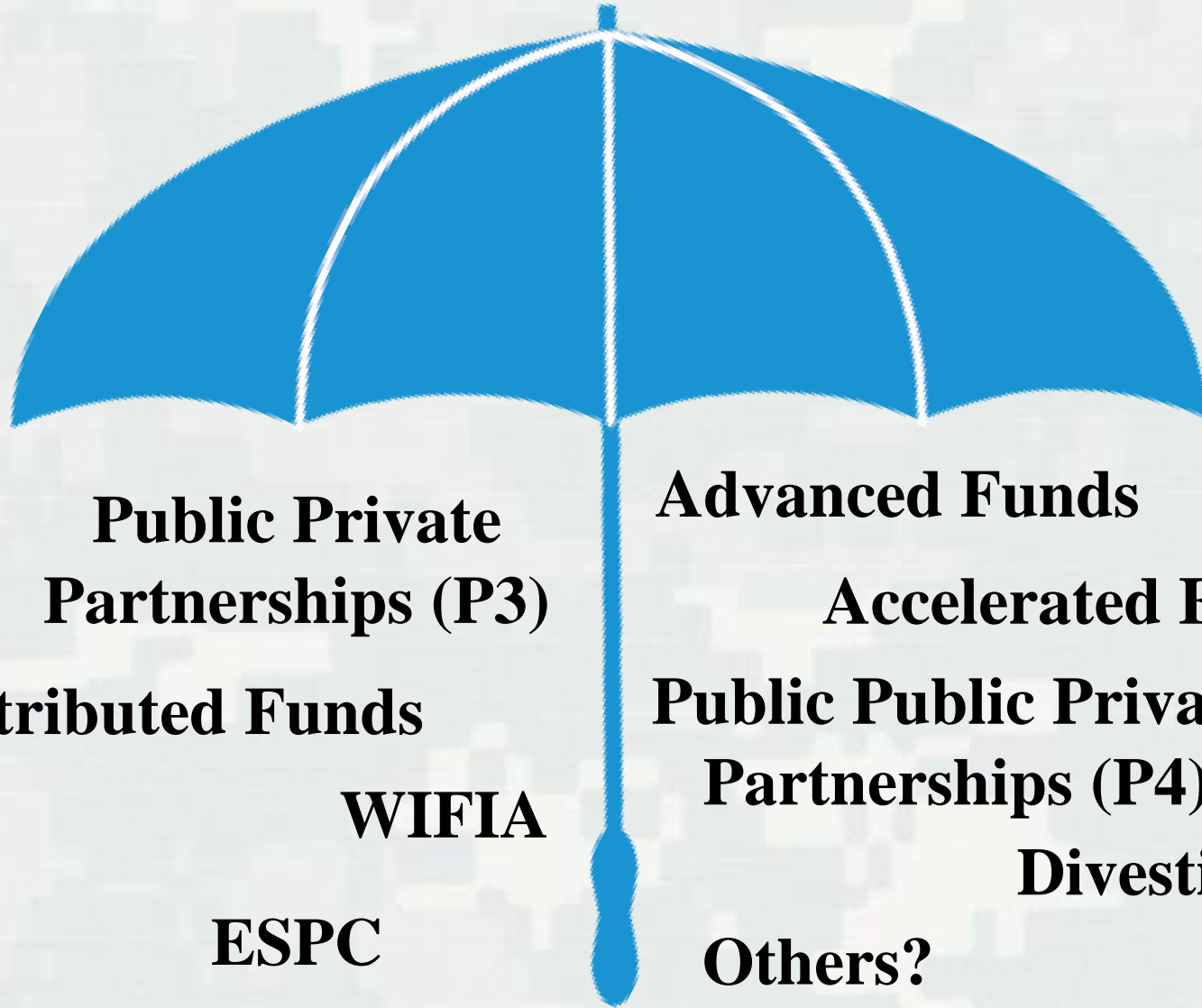
O&M – PM, Corrective and Minor Maintenance

O&M – Minor and Major Maintenance

Notional Life-Cycle Asset Management Strategy



Alternative Financing



**Public Private
Partnerships (P3)**

Advanced Funds

Accelerated Funds

Contributed Funds

**Public Public Private
Partnerships (P4)**

WIFIA

Divestiture

ESPC

Others?



Key P3/P4 Principles

■ P3/P4 Background and Operating Context

- ▶ Infrastructure Investment, Recapitalization a National Challenge: Bigger than Corps
- ▶ P3/P4 Not as Mature in US: Municipal Bond Market, Unique US Risk Profile
- ▶ P3/P4 is Essentially Another Acquisition Tool, Though Complex & Longer Term
- ▶ P3/P4 Cost of Money and Investor ROI, and Primacy of Federal/Taxpayer Equities
- ▶ P3/P4 Application in Water Resources Context is Presenting Challenges

■ P3/P4 Can Help the Corps/Sponsors Address Two Critical National CW Infrastructure Challenges

- ▶ Existing Infrastructure: Sustain Performance, Extend Service Life, and/or Buy Down Risk for the Nation
- ▶ New Infrastructure: Accelerate Delivery, Reduce Life Cycle Costs and Achieve Earlier Accrual of Project Benefits to the Nation

■ Three Primary P3 Revenue Generation Mechanisms

- ▶ User Payments
- ▶ Availability Payments (Federal Budget)
- ▶ Commercial/Ancillary Revenues



U.S. Harbor Deepening Challenges

- ***Authorization:*** Difficult and Lengthy Process from Study to Authorization
- ***Investment:*** Federal Budget and Appropriation Uncertainties
- ***Dredging:*** Placement Challenges, Environmental Mitigation, Increased Maintenance Costs
- ***Handling Facilities and Space:*** Need Expanded Cargo Handling Facilities and Improved Intermodal Connections



Regional Sediment Management and Beneficial Use: Sustainable Solutions

Navigation/
Dredging



Flood Risk
Management



Environmental
Restoration



Regional Sediment Management Operating Principles

- Recognize Sediment as a Regional Resource
- Balanced, Economically Viable, Environmentally Sustainable Solut'ns
- Improve Economic Performance by Linking Multiple Projects
- Optimize Operational Efficiencies & Natural Exchange of Sediments
- Local Actions with Regional Benefits
- Apply/Develop Technology & Tools to Optimize System
- Share Information & Data, Reduce Data Duplication
- Coordinate, Communicate, Collaborate



Stakeholders and Partnering are Key



- Work Together and Leverage Joint Efforts
- Understand and Communicate Civil Works Value to Nation
- Find Consensus on Major Initiatives
 - Identify Investment to Achieve Outcomes
 - Engage in Dialogue
- Be Mutually Supportive
- Deliver Shared Messages
- Involve & Engage End-Users
- Seek to Influence Decision-Makers



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Closing Thoughts

- **Water/Port Infrastructure Important to US Economy**
 - ▶ 98% of US Overseas Trade by Weight Moves Thru Corps Navigation Systems
 - ▶ 60% of US Grain, 22% of Coal, 22% Petroleum
 - ▶ Provides Strategic Overseas Deployment Platform
 - ▶ Has Capacity to Help Relieve Congestion Pressures on Other Modes
- **But, Nation's Water Infrastructure is Aging, Performance is Degrading, and Economic Impacts are Decreasing**
- **U.S. Population Projected to Increase to 110 Million in 30 Years**
- **U.S. Imports and Exports Projected to Increase Significantly**
- **Panama Canal New Locks Opening in 2016 – Global Post-Panamax Fleet to Increase**
- **Increased Grain Exports Expected as Result of Transportation Cost Savings Associated with larger Vessels**



**P3 Financing Opportunities Should be Considered Where
They Make Sense**



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Questions ???

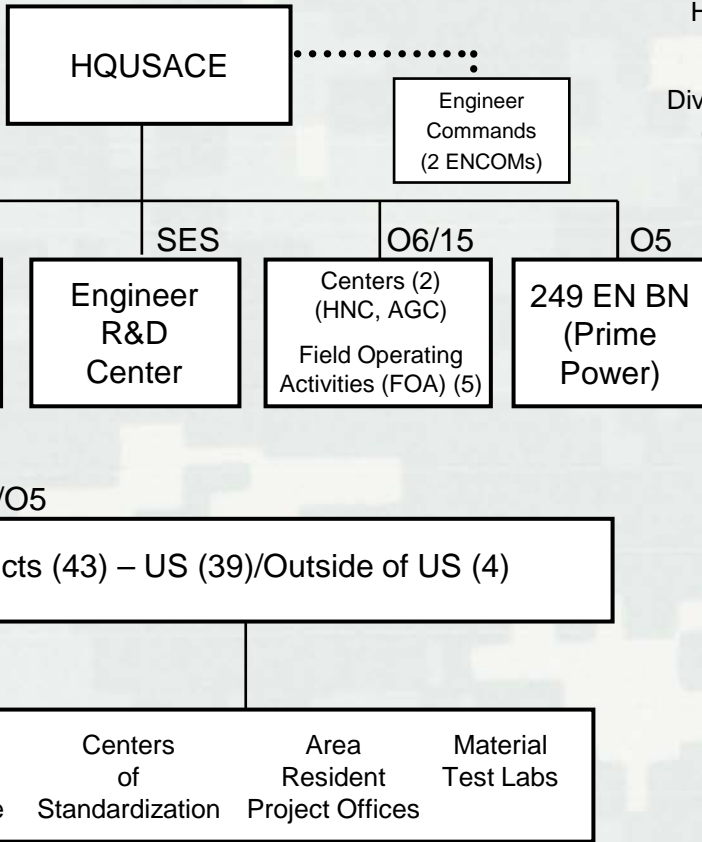


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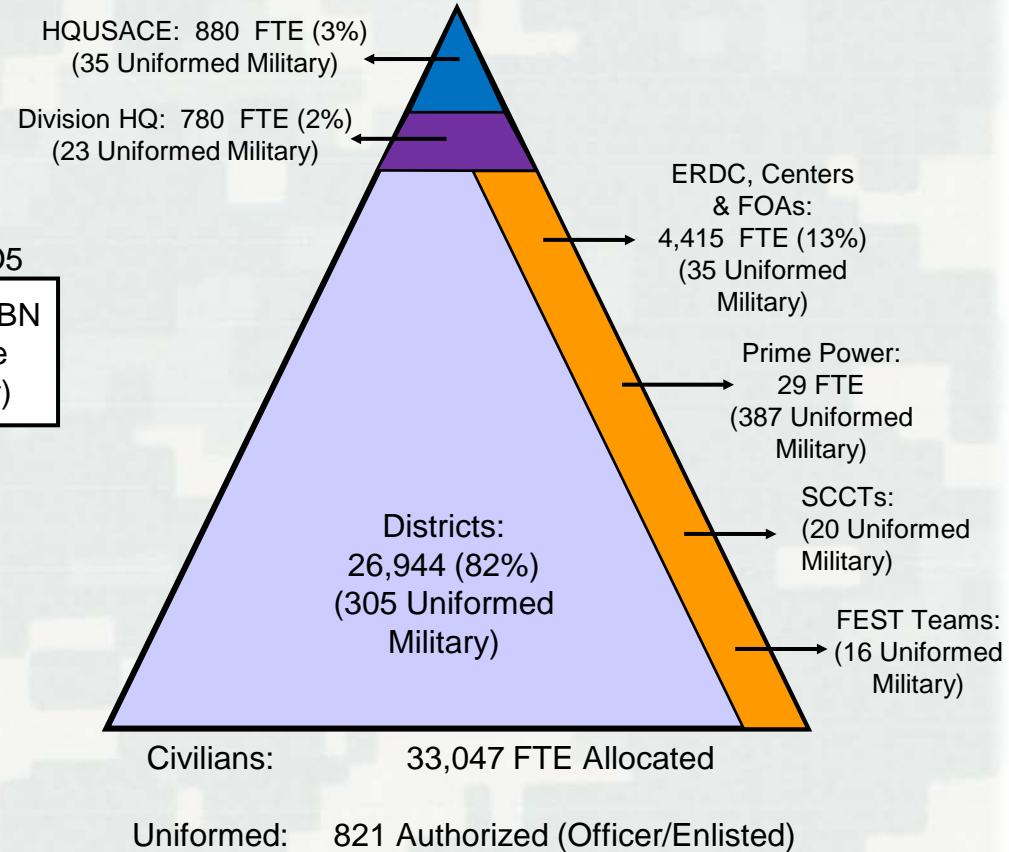
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USACE Organization and Manpower

USACE Organization



Distribution of Civilian Full Time Equivalents (FTE) & Uniformed End Strength (ES)

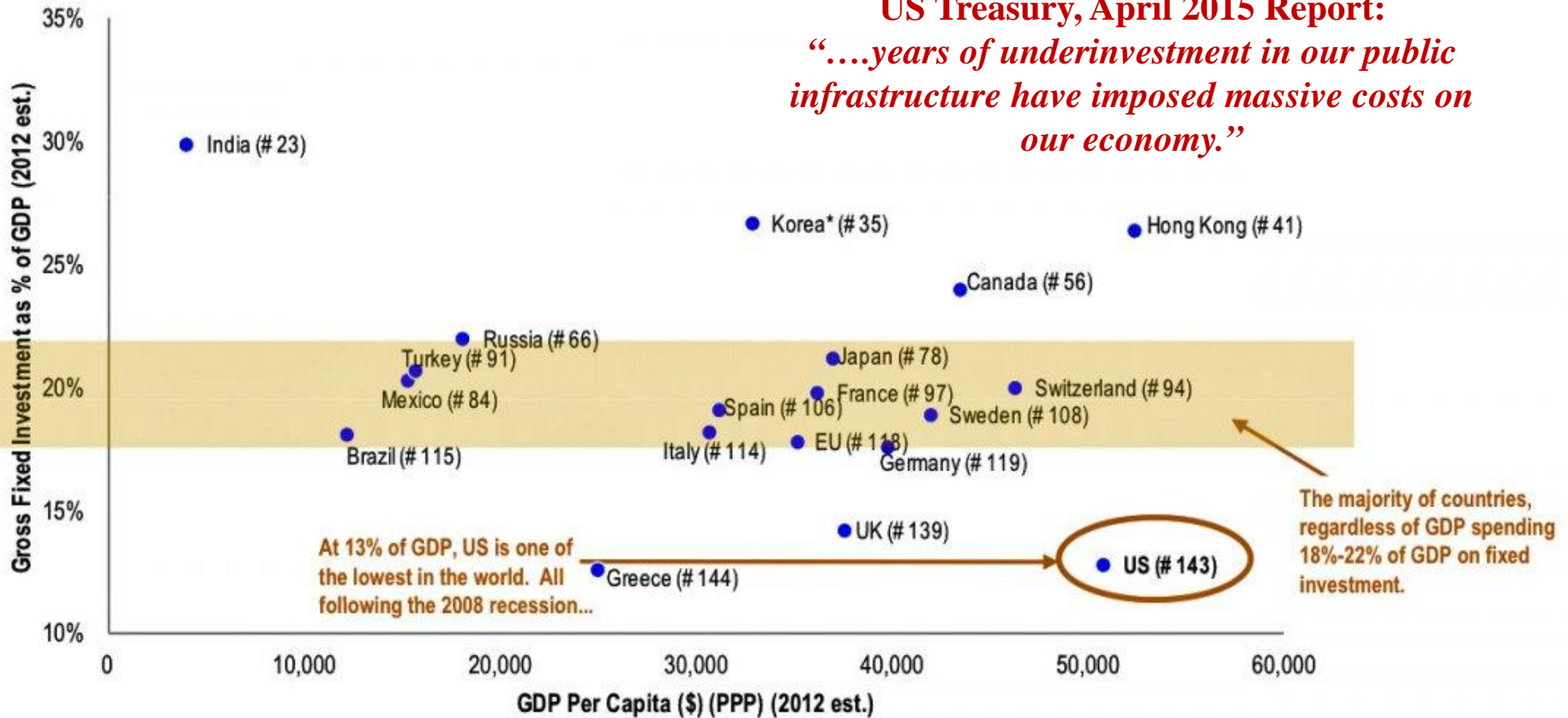


Workforce Size Driven by Customer Programs – 95% FTE Project Funded

United States Relative to Other Nations

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

Estimates for 2012 The rank of Gross fixed investment as % of GDP is in the parenthesis.



Low Investment in Infrastructure



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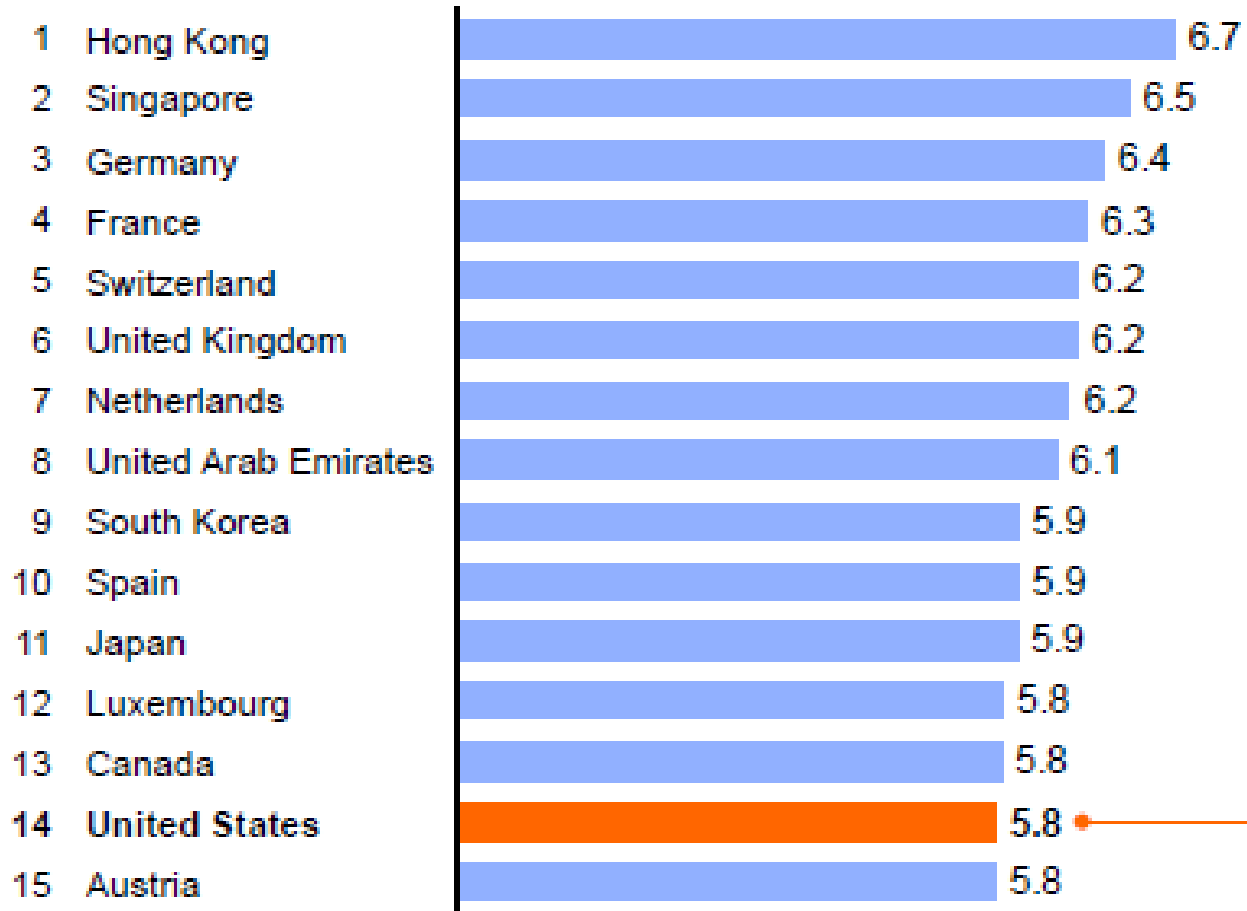
Relative Quality of US Infrastructure

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



Sector-specific indexes, 2012–13

Out of all 144 countries

Ports
United States
#19

Roads
United States
#20

Power and telephony
United States
#21



IMTS Capital Investment Strategy

- A Risk-Informed Portfolio Investment Approach, Focused on Maximizing System Performance



- Nationally Consistent and Repeatable Approach Across Entire IMTS
- Buys Down Risk, Improves System Reliability
- Mitigates Economic Impacts to Marine Stakeholders



Lifecycle Portfolio Management

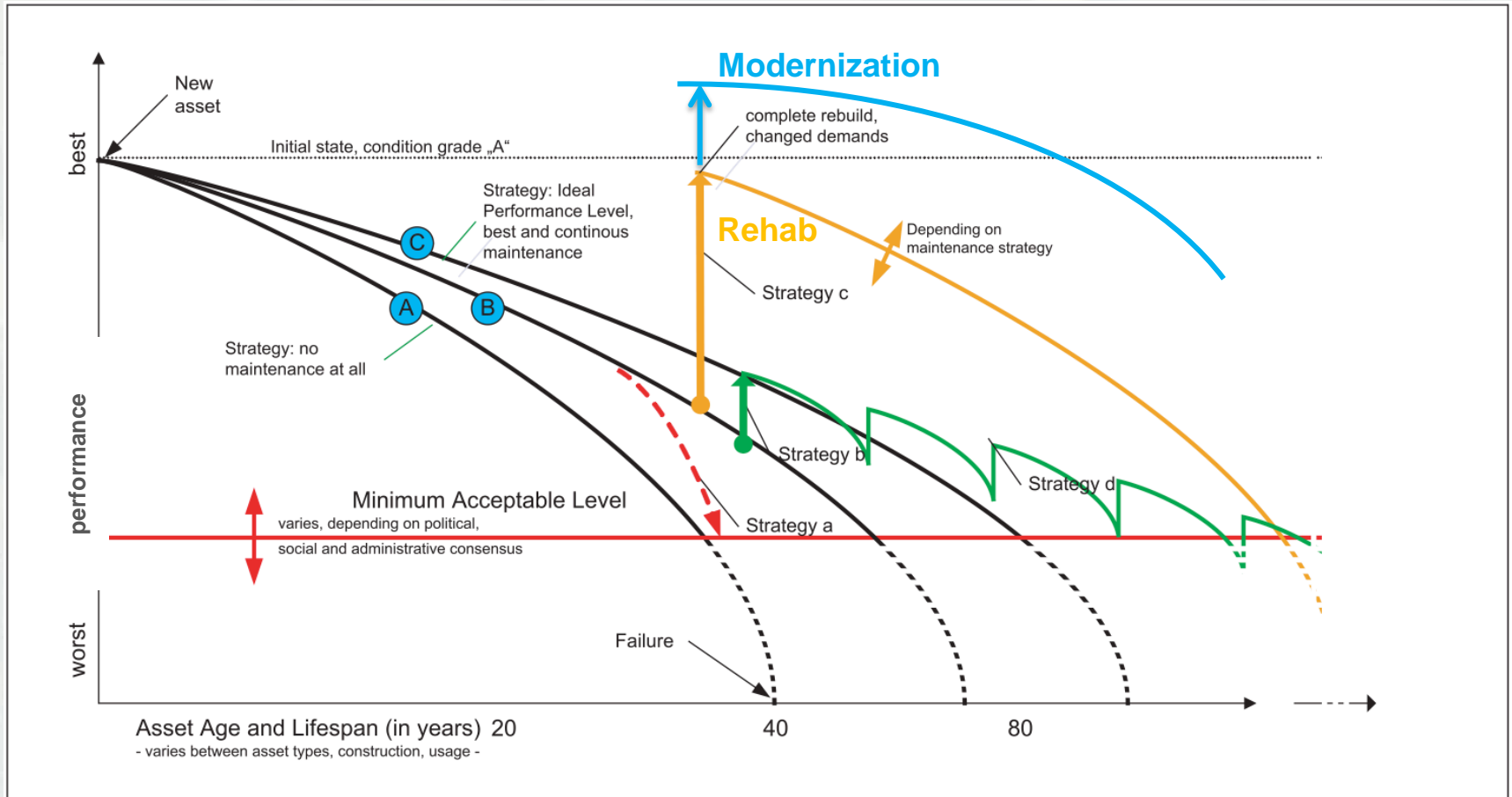


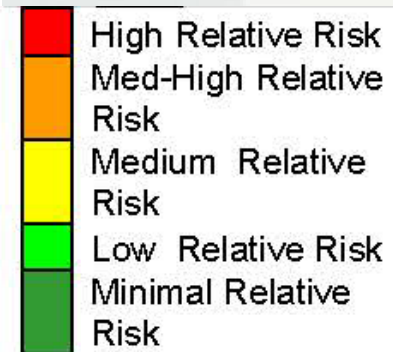
Fig. 1



Investment Metric: Risk to Performance

Risk = Probability of Failure x Consequences → Investment Priority

		Condition \ Consequence		Condition				
				F (1)	D (2)	C (3)	B (4)	A (5)
				Failed	Poor	Fair	Good	Excellent
Consequence Category	1	High	1	2	6	10	15	
	2	Medium High	3	5	9	14	19	
	3	Medium	4	8	13	18	22	
	4	Low	7	12	17	21	24	
	5	Minimal	11	16	20	23	25	



What are P3s/P4s? And Why?

- Public-Private Partnerships (P3s) and Public-Public-Private Partnerships (P4s) are long term contracts between public sector contracting authorities and a private sector consortium to deliver public infrastructure.
- Successful P3/P4 transactions typically share the following:
 - Life Cycle Perspective: Private Partner provides full up-front financing with “Bundled” project delivery across phases (any combination of design, construction, operations, maintenance, and/or rehab)
 - Incentivized Risk Sharing: Private Partner assumes substantial risks for compensation based on key performance outcomes
 - Public Ownership: Public Partner retains project ownership and ultimate control

Benefits of P3s

- Faster Delivery of Infrastructure
- Efficiency Gains from Innovation and Life-Cycle Cost Savings
- Incentive-Driven Performance Results in Better Service Provision
- Single Source of Accountability

