

U.S. Army Engineer Research and Development Efforts on Sustainability and Life Cycle Assessment



Jim P. Allen, PE
Research Civil Engineer/Transportation/Planner
USACE, Engineer Research & Development Center

For the Pavement Life-Cycle Assessment Symposium-2017

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US Army Corps of Engineers
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Bottom Line Up Front

- U.S. Army Engineer Research and Development Center-Construction Engineering Research Laboratory (ERDC-CERL) and the University of Illinois at Urbana-Champaign are key partners
- Sustainability is a core value of how USACE does business. Incorporating resilience and leveraging smart systems within sustainability helps define the path forward



Agenda

- Brief overview of ERDC-CERL
- ERDC Sustainability and LCA Efforts
- Sustainable vs Resilient vs Smart Infrastructure?
- Opportunities
- Contact and Questions



ERDC-CERL's Mission: to develop and infuse innovative technologies to provide excellent facilities and realistic training lands for the Department of Defense, the U.S. Army and many other customers.



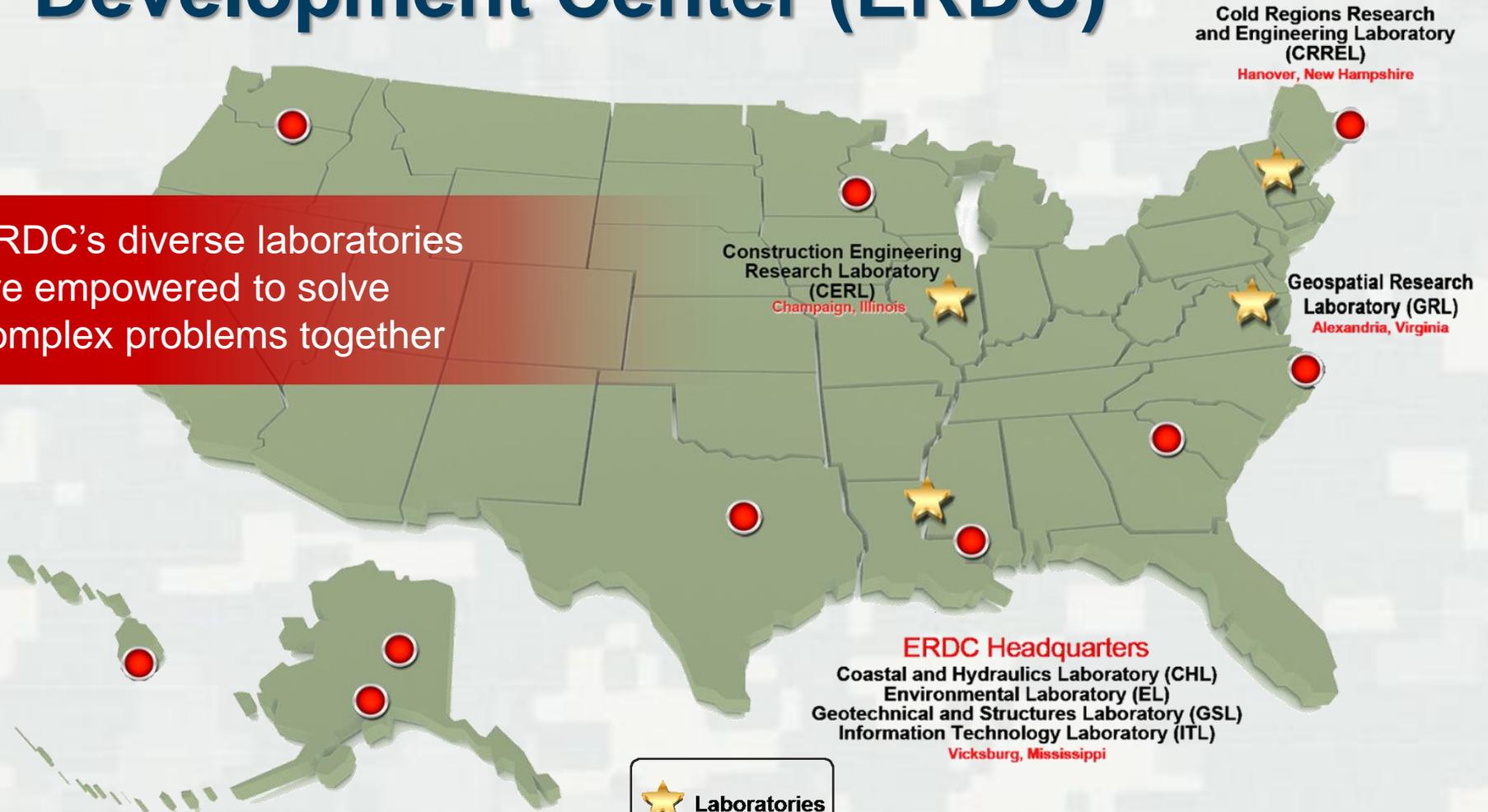
ERDC

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Engineer Research and Development Center (ERDC)

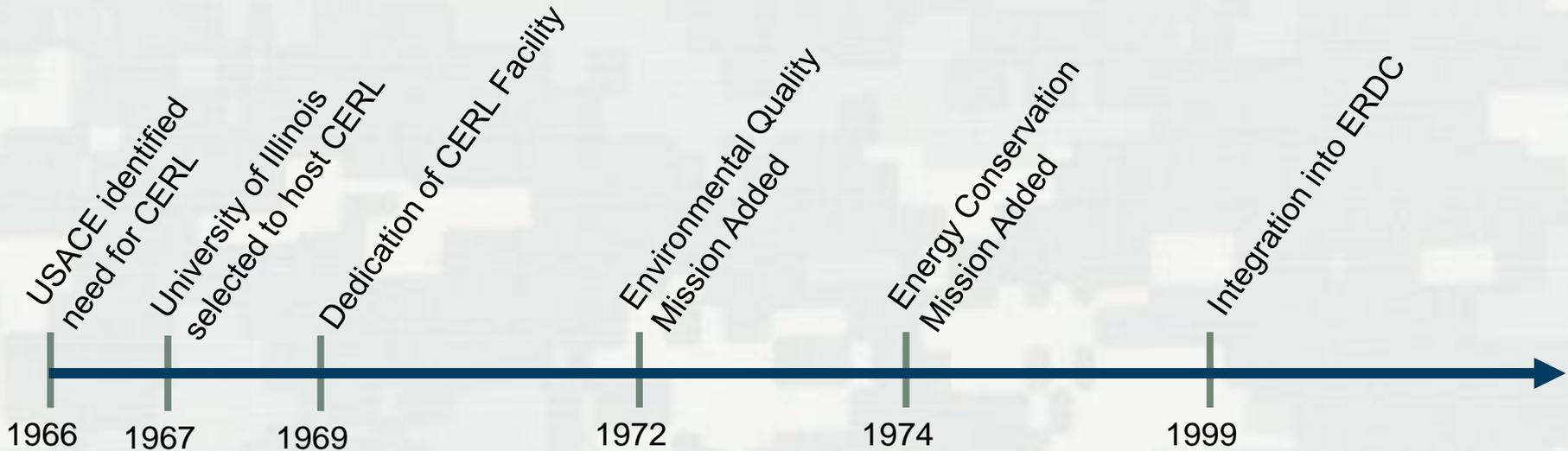
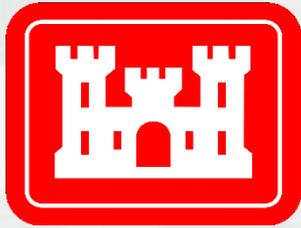
ERDC's diverse laboratories are empowered to solve complex problems together



★ Laboratories
● Field Offices



ERDC-CERL History





Military Programs Mission

Provide premier engineering, construction, real estate, stability operations, and environmental management products and services.

- Military Construction
- Environment
- Real Estate
- Contingency Support
- Interagency and International Services
- Installation Support



<http://www.usace.army.mil/Missions/MilitaryMissions.aspx>



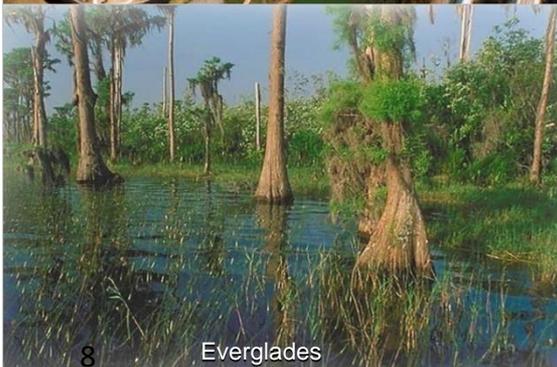
Civil Works Program Vision and Mission



Lock and Dam 15 (Mississippi River)



Flood Wall (Williamson, KY)



Everglades

Dedicated to providing quality, responsive service to the nation in peace and war.

- Navigation
- Flood Risk Management
- Infrastructure
- Recreation
- Environmental Stewardship
- Emergency Response

<http://www.usace.army.mil/Missions/CivilWorks.aspx>



Dredge ESSAYONS (Coos Bay, OR)



Lake Seminole (Mobile District)



Bonneville II Powerhouse (Washington)

ERDC Sustainability Efforts

- Sustainable Installations – Net Zero Planning
- Sustainable Energy Solutions
- Sustainable Water and Waste
- Sustainable Facilities and Infrastructure
- Sustainable Natural Infrastructure
- Green Remediation and Reuse



Center for the Advancement of Sustainability Innovations(CASI)

- Established in 2006 at CERL
- Focus ERDC expertise, technologies and partnerships towards achieving more sustainable missions, facilities, and operations
- CASI teams strive to measure sustainability innovations against the triple bottom line of mission, environment, and community



Reducing Construction and Demolition Waste – Residential Communities Initiative

Concrete recycling with on-site crusher.



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Historic Preservation at Ft. Leonard Wood

Mural painted by Samuel Countee, placed above the German POW fireplace on the main floor of Bldg. 2101



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McMurdo Station Antarctica Run Off Characteristics

Extreme incident showing raging water from snowmelt (12 December 2007)



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Airfield Redesign for Wheeled and Ski-fitted Aircraft

Isometric view of the apron, taxiway, and town site area of the proposed consolidated airfield



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McMurdo Station Antarctica Snow Paver Test and Vehicle Impact Testing on Snow Roads

SnowPaver groomer, McMurdo Station (2010)



Prevent snow road deterioration



- *Low Tire Pressure (18 psi)*
- *Low Speed (25 mph)*
- *Clean Vehicles*
- *Limited Traffic (wide tires only)*
- *Don't ride the ruts*



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Airfield Redesign for Vertical Take Off Aircraft



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FWD Structural Assessment of Geogrid Reinforced Base Course: Allows reduction of 33-42% of aggregate course

Cored asphalt concrete



Bioswales and Wetland Treatment Systems Adjacent to Transportation Infrastructure

*Swales before and after
improvement*



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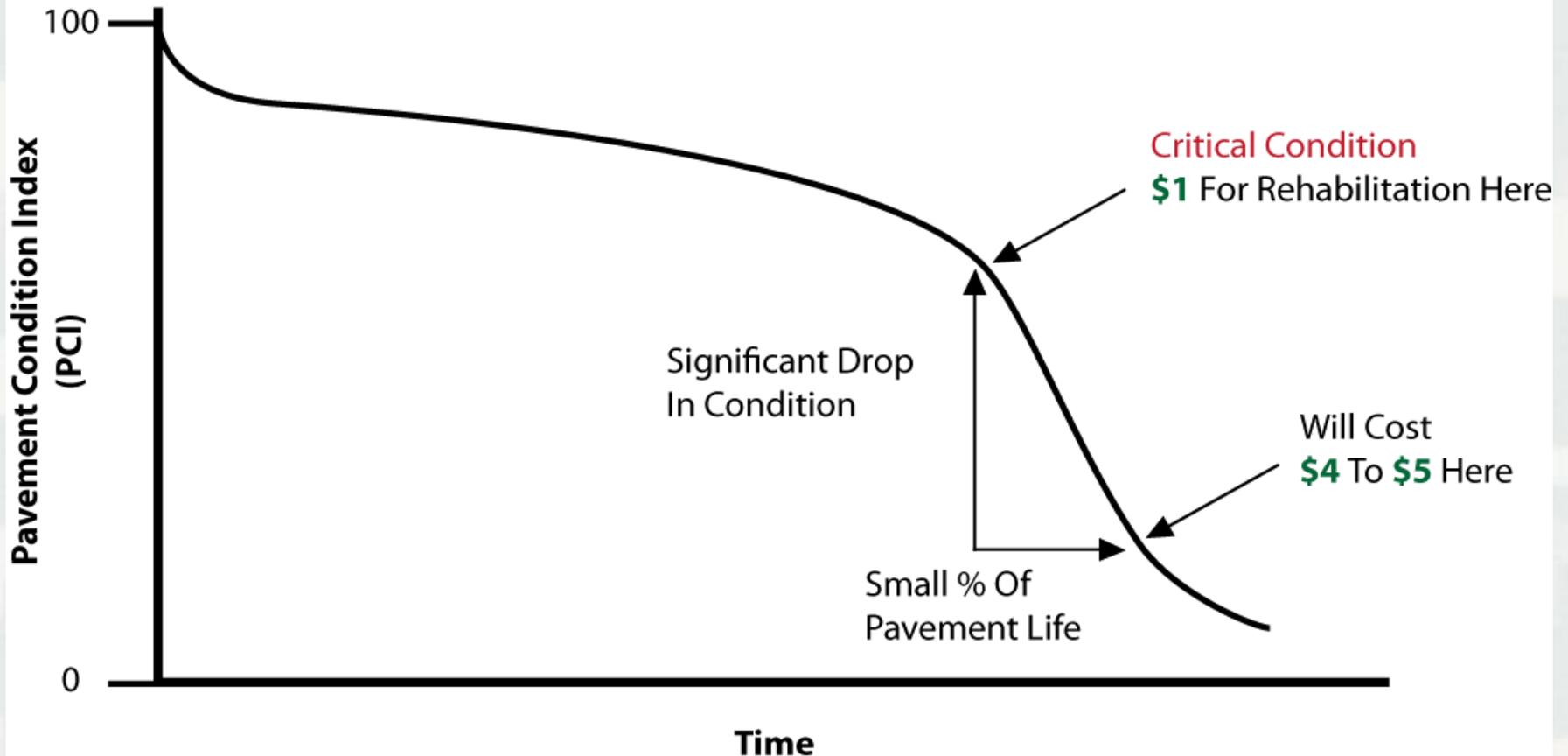
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Pavement Life Cycle

Pavement Life Cycle



Pavements need to be managed- not simply maintained.

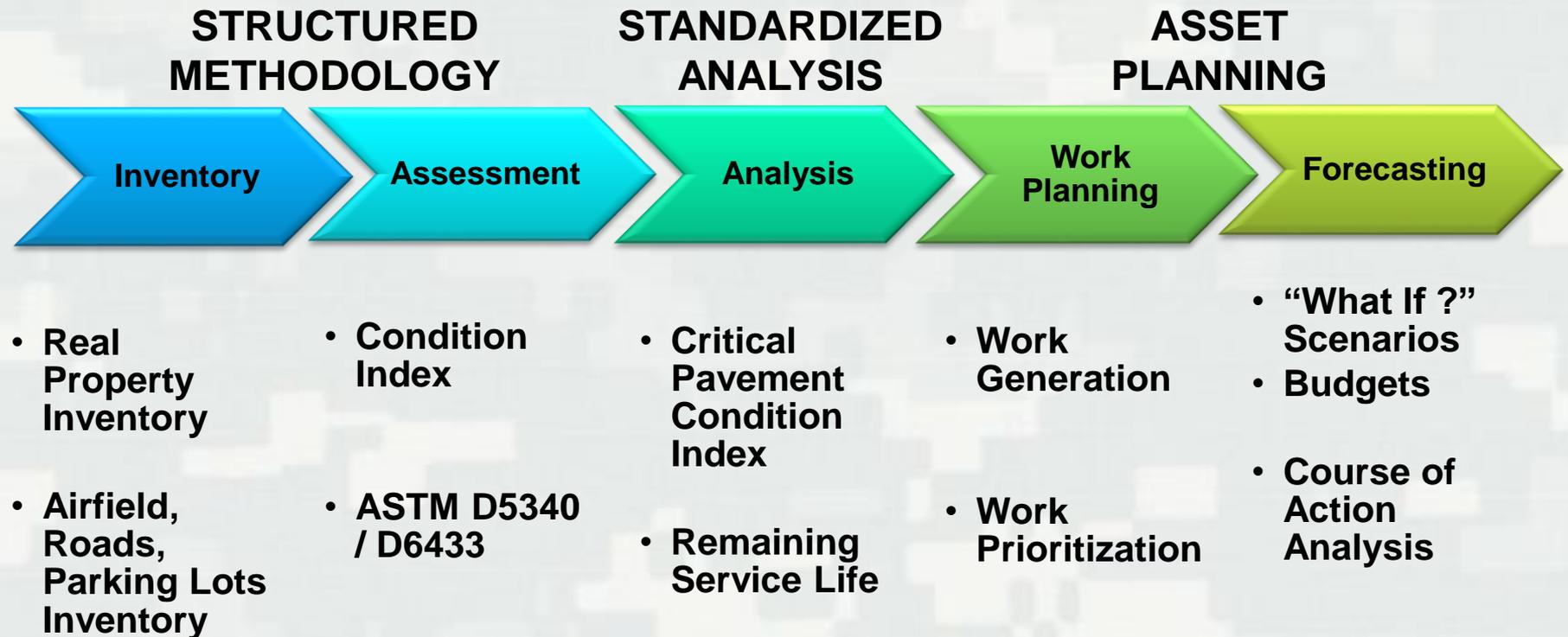
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PAVER Sustainment Management System (SMS) Methodology



SMS Enterprise to Combine Modules

	BUILDER for Building Components <i>Program Management</i>
	FUELER – NEW! for Fuels Systems
	PAVER for Airfields and Roads
	RAILER for Track
	ROOFER for Roofing <i>Project Management</i>
	Utilities – NEW! for Water, Sewer, Storm Sewer, Electrical, Gas, and Mech. Systems

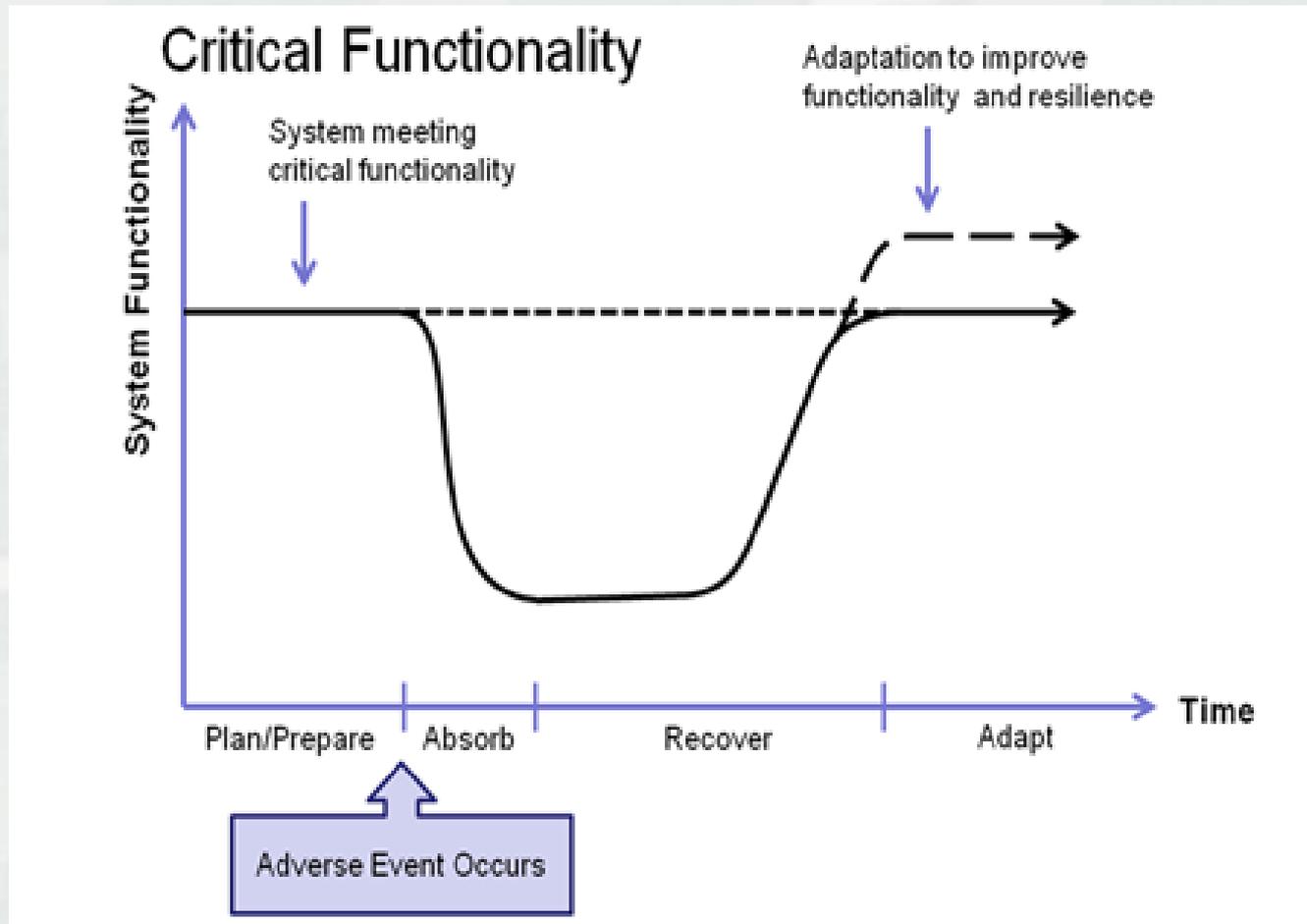


Military Planner Perspective

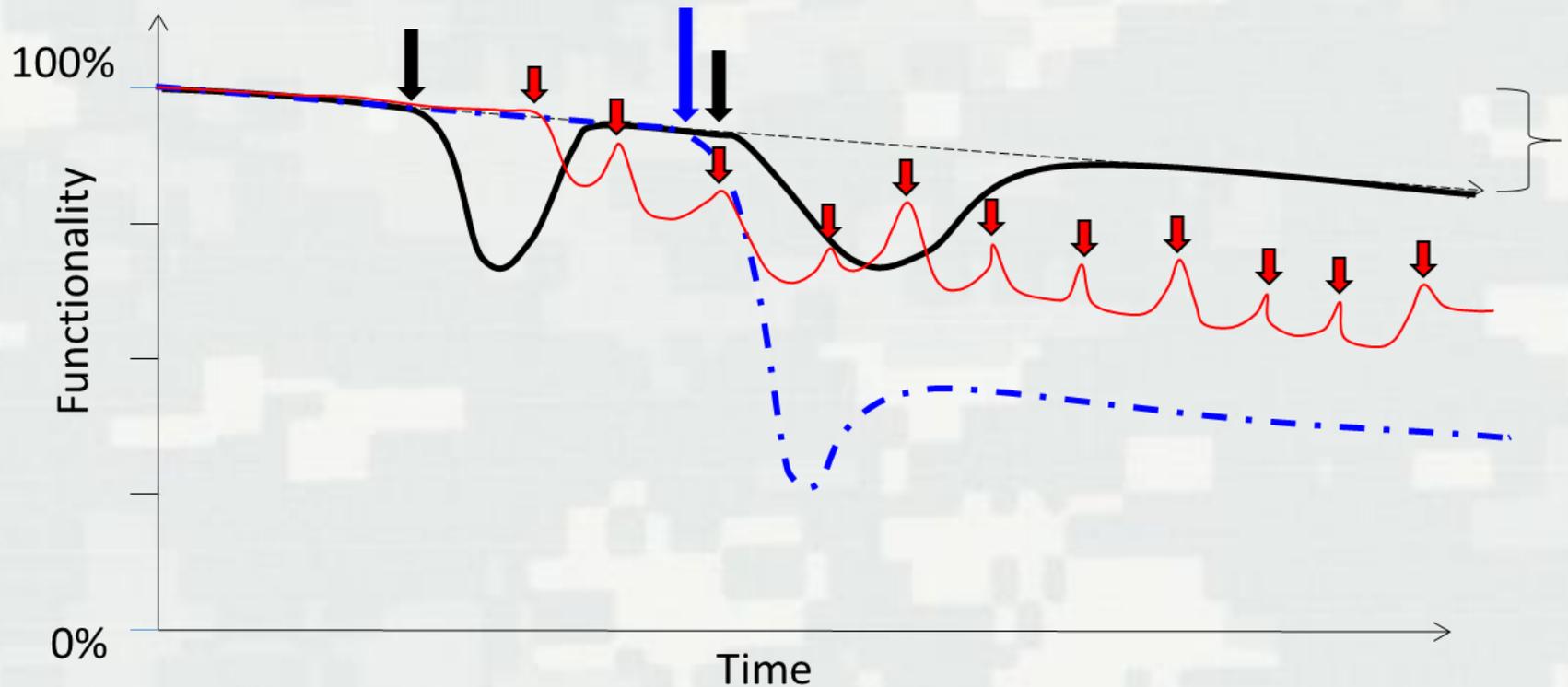
- Planning intervention must have a national security nexus
- DoD Directive 4715.21 Climate Change Adaptation and Resilience, January 2016
- Resilience is the “end” which achieves the objective of climate change adaptation
- “Can we plan systems that are resilient, sustainable, and smart?”



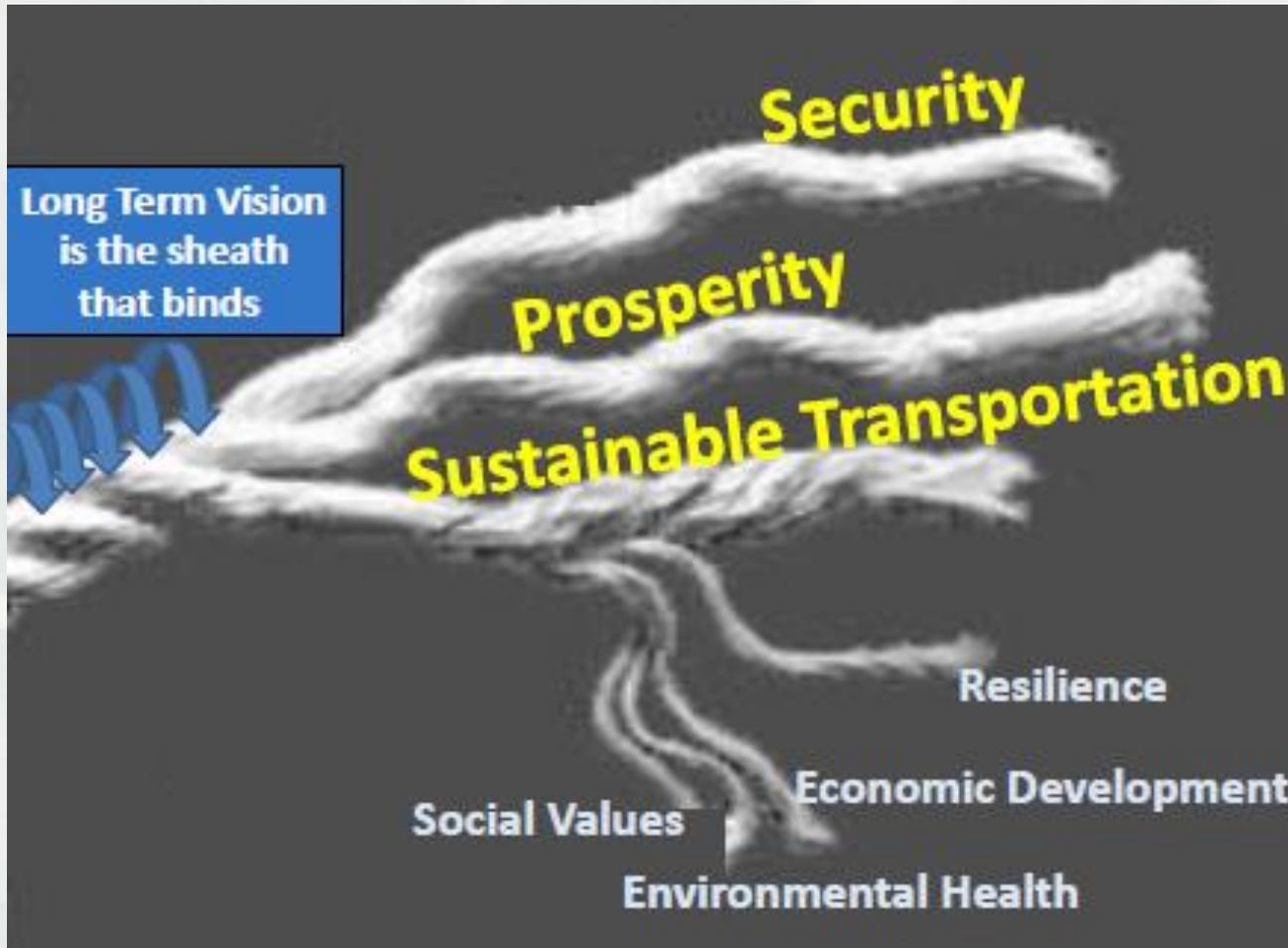
Resilience is the ability of a system to prepare for, absorb, recover from, and adapt to disturbances



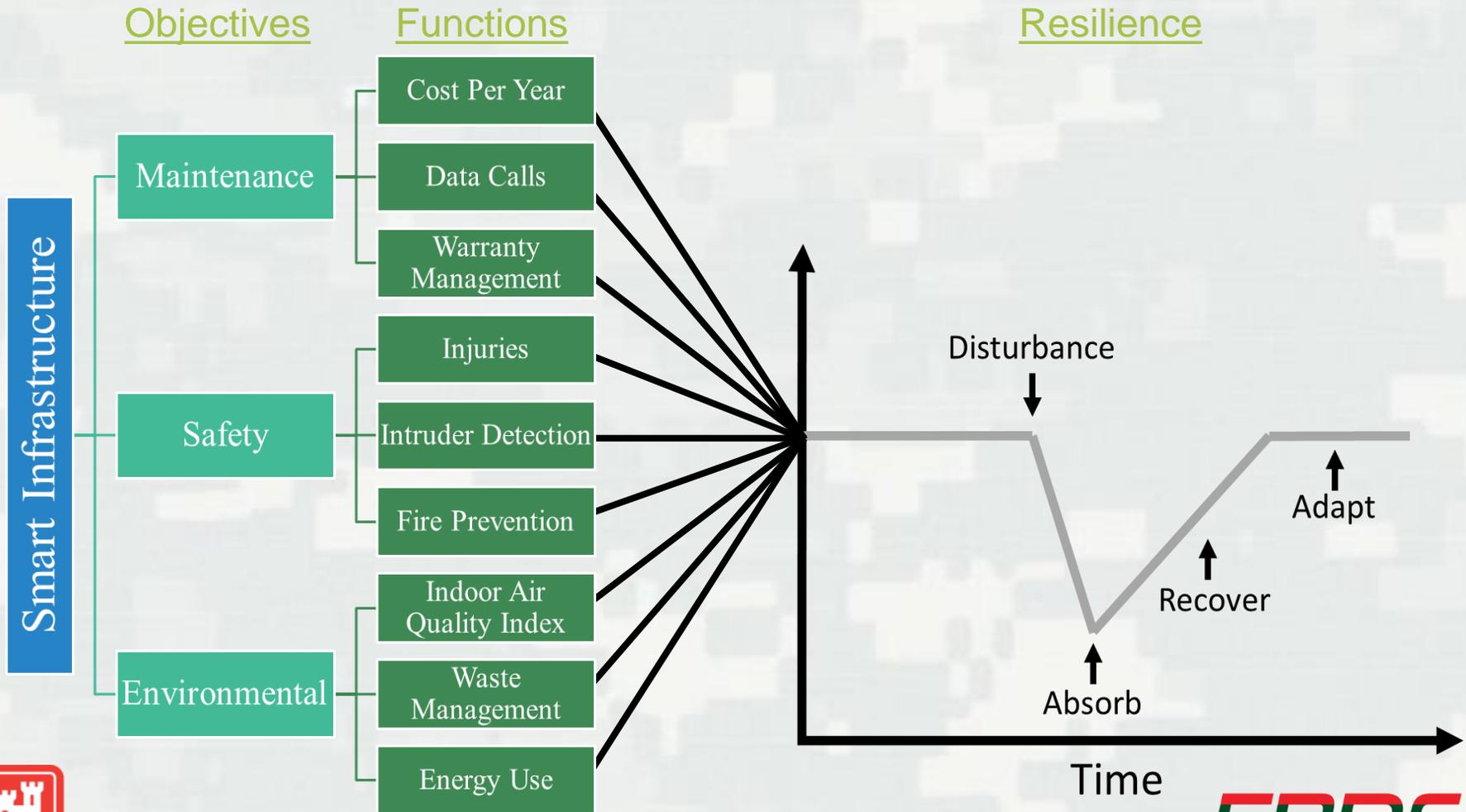
Shocks to the system or community may be recurring or compounding



Sustainable versus Resilient



Smart and Resilient Infrastructure?



Resilience Elements Framework

- Fault tolerant systems
 - Adaptive solutions
 - Critical redundancy
 - Mitigation
-
- These can be applied across various system types such as infrastructure, government, health services, and ecology



Conclusion

- Sustainability continues to be a strong element in the ERDC portfolio
- Opportunity: sustainable and holistic life-cycle assessment research that leverages smart systems and data analytics and builds resilient systems



Contact Info / Questions?

Mr. Jim P. Allen, PE

Research Civil Engineer/Transportation Planner

ERDC-CERL

Champaign, IL

(217) 373-3497

james.p.allen@usace.army.mil

