

Civil Works Sustainability & RSM

Heather Morgan, RLA. HQ E&C (lead)

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Todd Bridges, ERDC

Brian Harper, IWR

Kyle McKay, ERDC

Kendall Zaborowski, PE., LRL

Steve Kopecky, HQ Planning (CEQ)

Anne Clark Baker, IWR

Katherine Touzinsky, ERDC

Matthew Bates, ERDC

Paul Boyd, Omaha District

John Shelley, Kansas City District

Stanford Gibson, HEC



**US Army Corps of Engineers
BUILDING STRONG®**



**STATIC
VS.
DYNAMIC**

STAGE

20 (1944)¹
19 (1880)²
18 (1820)²
17 (1765)²
16
15
14
13
12
11
10
9
8
7
6
5
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1
J
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D
C
B
A

LEGEND

NOTES

¹ Bankline as shown on the 12th Edition of "Map of the Mississippi River, Cairo, Ill., to the Gulf of Mexico, La.," dated January 1944.

² Bankline as shown on maps of "Lower Mississippi River, Early Stages, Cairo, Ill., to Baton Rouge, La."

Base Map from published No. 1000, River Commission Quad map.

Stages later than Mississippi River Meander Belt

BANKLINE SYMBOLS

Traceable prehistoric final terrace positions of meanders and incised historical terraces.

Artificially selected meander prehistoric bankline positions marking stages of meander growth.

Indefinite prehistoric bankline positions.

CUT-OFF SYMBOLS

Mark cutoff following indicated stage.

Mark cutoff following indicated stage.

Feet

**GEOLOGICAL INVESTIGATION
MISSISSIPPI RIVER ALLUVIAL VALLEY
ANCIENT COURSES
MISSISSIPPI RIVER MEANDER BELT
CAPE GIRARDEAU, MO.-DONALDSONVILLE, LA.**

IN 15 SHEETS

SCALE IN MILES

SHEET 4

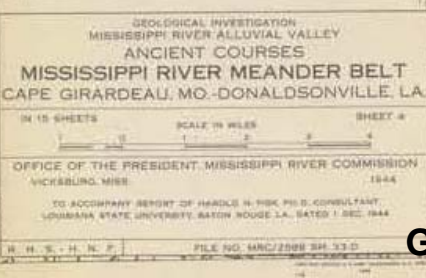
OFFICE OF THE PRESIDENT, MISSISSIPPI RIVER COMMISSION
VICKSBURG, MISS.

1944

TO ACCOMPANY REPORT OF HADLEY H. HICK, PH.D. CONSULTANT
LOUISIANA STATE UNIVERSITY, BATON ROUGE, LA., DATED 1 DEC. 1944

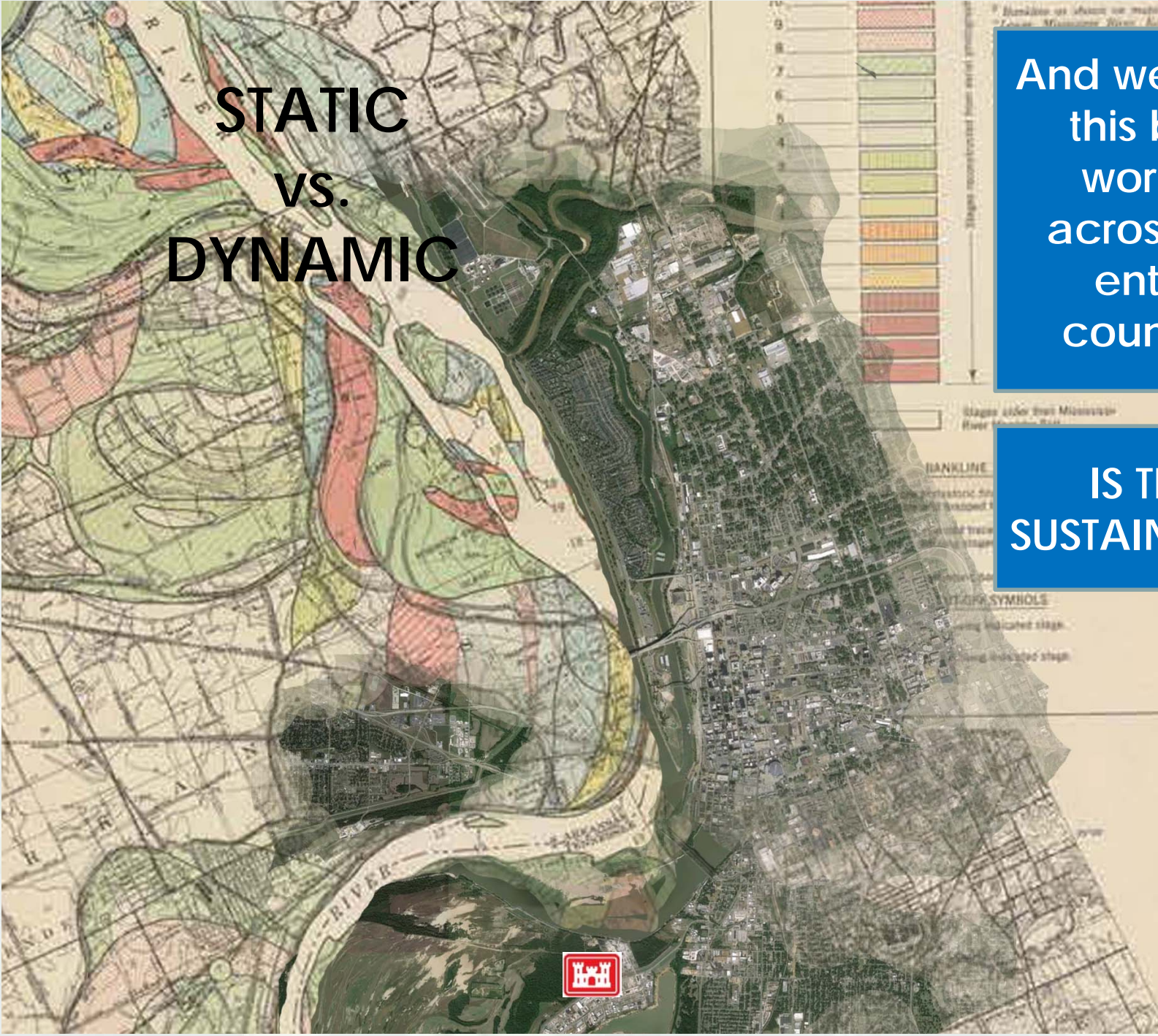
H. H. S. - H. N. P.

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habitation



STATIC VS. DYNAMIC

And we O&M
this built
work...
across the
entire
country?

IS THIS
SUSTAINABLE?



STRONG®



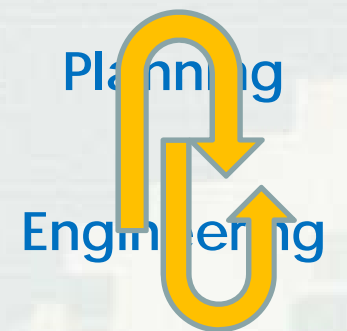
What is our relationship with Civil Works?



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finite resources?

=



Three SCALES...

6FT elevation:



Wilderness Road Complex
Ft Carson, LEED Platinum



Human and Dwelling
scale...

Most comfortable,
we can touch, hug,
live in and build it...

Easier to be
measured and
quantifiable

Already existing
guidelines that marry
private sector and
government
application

Already required
with all new federal
construction

Climate controlled®



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Three SCALES...

3,000FT elevation:



Wittier Narrows. CA (Los Angeles)

Regional landscape scale...

Civil Work program resides here...

Dam and Levee Safety Program...
modification studies.

Not as easy to be measured
and quantifiable

COMPLEX Layered..
Societal and Political
demands, natural resources
(NEPA, ESA) demands, non-
fed sponsors demands,
states water rights, trade and
commerce needs

Not climate controlled



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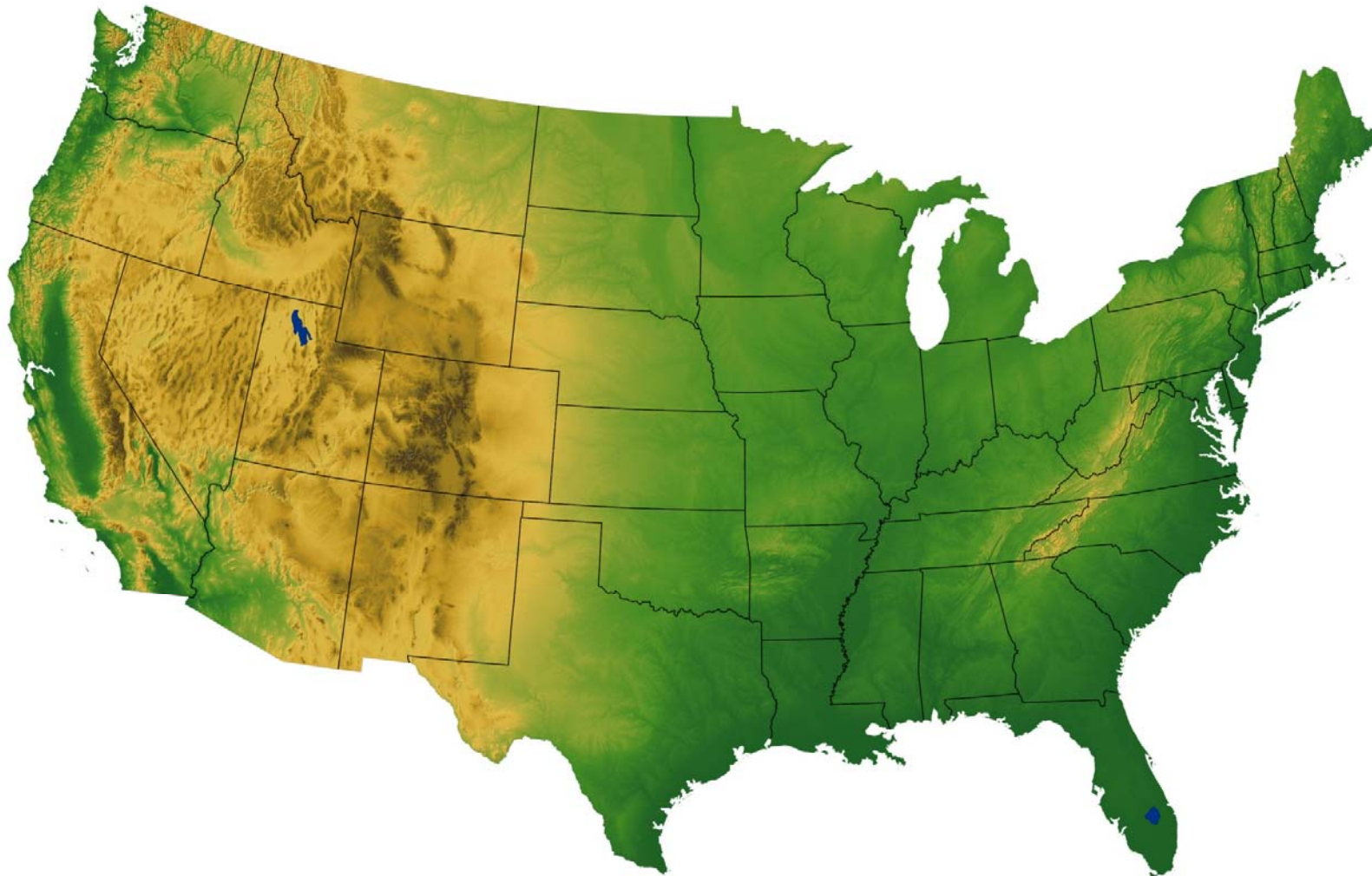
Three SCALES...

30,000FT elevation:

This scale is a hybrid:

- **one part global "think tank"** for an ongoing conversation between like-minded but otherwise isolated visionaries and practitioners at the forefront of USACE,
- **one part catalytic organization** that takes the many conversations up to a higher

the District,
and to



STRONG®

S

Scales of CW Sustainability Implementation

SCALES OF CW SUSTAINABILITY IMPLEMENTATION
Higher elevation = Larger horizontal application

Small "s" up to big "S"

s

30,000 ft elev. = The National Perspective (THE RIVER)

CW Transformation Strategy
Four Pillars!!!

CW Sustainability Strategy
Geoengineering

Watershed Informed Budgeting
Energy, Sustainable Policy,
Circulars, USGBC (ie, sea level
rise)

IWR: Actions for Change

Silver Jackets Program

3,000 ft elev. = The Regional Perspective (The Tributaries)

CW Program

Engineering and Construction

Non-Structural Pilots

Watershed Studies

Performance landscapes

Dam and Levee Safety Program

Operations

USACE Sustainability Plan

**ERDC: Environmental
Benefits Analysis**

6 ft elev. = The Building Centric Dwelling Perspective (The Streams)

MILCON Energy & Sustainability Initiatives



Sustainable Buildings Policy for CW

LEED: USGBC



CW Transition Strategy
Four Pillars!!!
CW Sustainability Strategy
Geoenvironmental Engineering

IV Action for Change

CW Program
Engineering and Construction
Non-structural Projects
Operations

Watershed Informed Budgeting
Energy, Sustainable Policy,
Circular Economy (ie, sea level
rise)

Offshore Jacket Program

Watershed Studies
Performance landscapes
Dam and Levee Safety Program

ERDC Environmental
Benefit Analysis

An aerial photograph of a vast, arid landscape. A dark, winding river flows through the center of the frame, carving a path through the dry, brownish-yellow terrain. The river's path is highly irregular, with many loops and meanders. In the background, a range of mountains is visible under a clear blue sky. The overall scene conveys a sense of scale and the interconnectedness of the environment.

ALL FLOWING TOGETHER

SCALES OF HOW, AND

Operations

ERDC: Environmental
Benefits Analysis

New Era of Water Resource Management



Civil Works Sustainability Initiative

Why is it so important?

We are no longer just doing sustainability because it is only good for the environ.

Because the health of the natural system that we are ALL hosted in, is of national security concern.

Is about long term goals – it's the ultimate goal – to sustain the nation

Values

Human Well-Being
Ecosystem Integrity
National Security

Integral to many efforts and directives in agency

Can serve as catalyst to create integration, innovation, strengthen and give support to all other agency outcomes and efforts.



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The Cross-Cutting

Sustainability

* All inform long term Sustainability as much as Sustainability helps to Integrate

Risk Management

Asset Management

Safety Programs

Climate Adaptation

Regional Sediment Management

Planning Modernization

Infrastructure Strategy

Resilience

Informed Budget

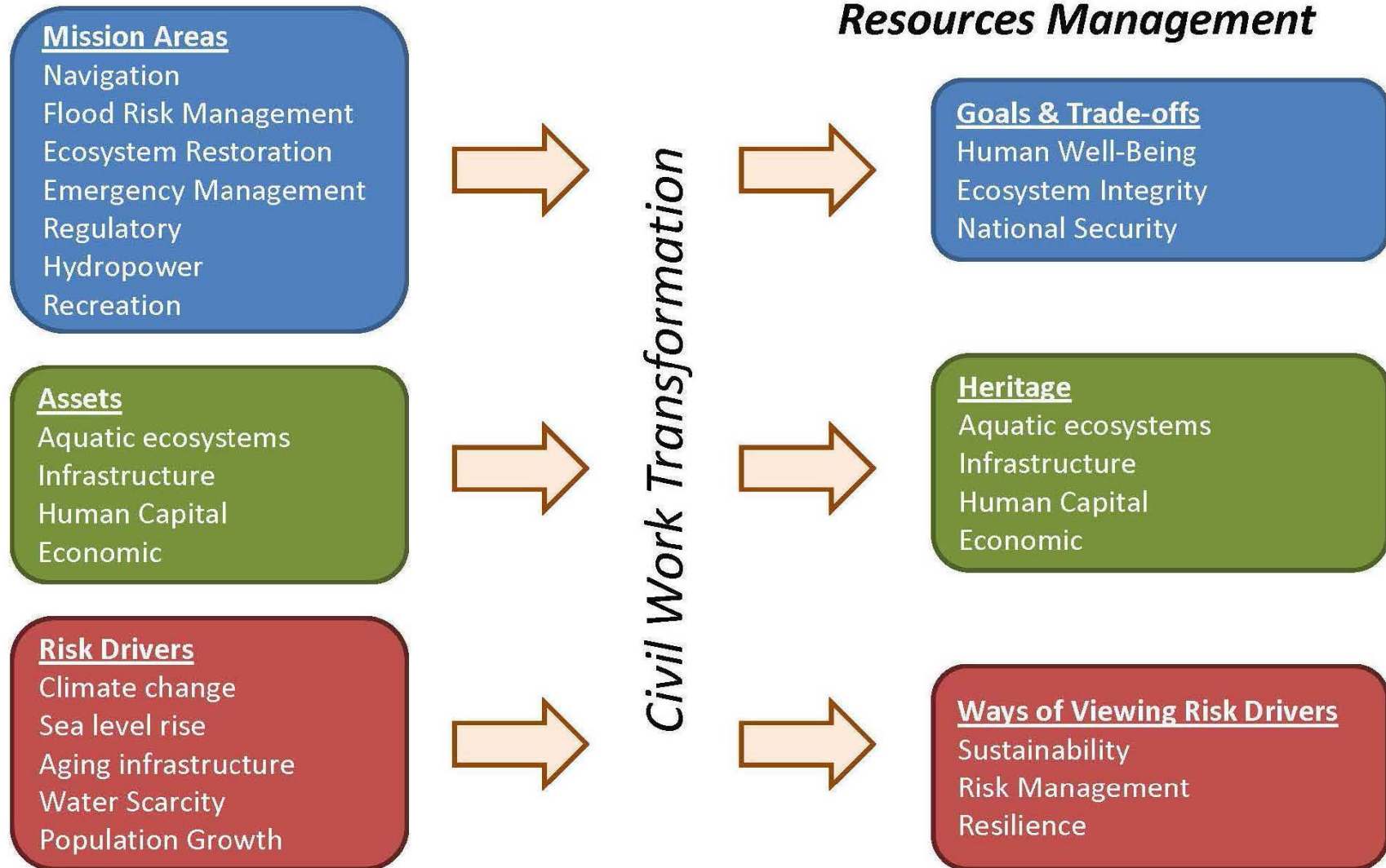
Engineering & Construction Programs

Planning Operations



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A New Era of Integrated Water Resources Management



Agency Efforts:

RSM

IWRM

EWN

NBF

Dam Safety

Asset Management

Resilience (even builds it)

EOPs

Sustainability Plan

Sustainable Building Policy

Mega-Projects

Silver Jackets

Watershed Informed Budgeting

Agency Directives:

CW Strategic Plan

National Report:

Responding to National Water
Resources Challenges

**Memo for Executive
Departments and
Agencies (CEQ)**

Oct 7, 2015: Incorporating
Ecosystem Services into Federal
Decision Making

**Executive Order
13698:**

PLANNING FOR FEDERAL
SUSTAINABILITY IN THE NEXT
DECADE

Engineering with Nature Guiding Principles

- Holistic
- **A systems approach**
- **Sustainable**
- Science-based
- Collaborative
- **Efficient and cost effective**
- Socially responsive
- Innovative
- **Adaptive**

<http://el.erdcl.usace.army.mil/ewn/>

Environmental Operating Principles

- **Foster sustainability as a way of life throughout the organization.**
- Proactively consider environmental consequences of all Corps activities and act accordingly.
- Create mutually supporting economic and environmentally **sustainable solutions.**
- Continue to meet our corporate responsibility and accountability under the law for activities undertaken by the Corps, which may impact human and natural environments.
- **Consider the environment in employing a risk management and systems approach throughout the life cycles of projects and programs.**
- Leverage scientific, economic and social knowledge to understand the **environmental context and effects of Corps actions in a collaborative manner.**
- Employ an open, transparent process that respects views of individuals and groups interested in Corps activities.

Enterprise Risk Management Framework

- **Adaptive, scalable, flexible**
- Enterprise-wide risk management
- Structured risk management and decision-making
- Evidence-based risk management
- Address uncertainty
- Transparency and inclusion of stakeholders

USACE. Commitment to deliver quality solutions and services: Establishing the corps risk framework. Draft EC.

Asset Management Tenets

- **Mission:** In concert with and supportive of USACE official water resource mission, service and related responsibilities
- **Consistent:** Common, repeatable application across USACE Civil Works that does not conflict with other current or planned asset management efforts
- **Reasonable:** Logical, rational and implementable in a sound, sensible manner based on good use of resources
- **Sustainable:** Capable of continued implementation and application based on reasonable resource expectations and/or availability
- **Defensible:** Having sufficient rigor, detail and documentation to withstand internal and external review (i.e., auditable, transparent, repeatable and unbiased)

Dam Safety Program Principles

- Public safety is the primary focus.
- Dam safety is a component of a broader flood risk management approach.
- An effective safety program requires continuous and periodic project inspections and assessments.
- The **sustainable, systems and collaborative approach** is the most effective way to manage and assess dams.
- Dam safety information and risk communication must be accurate, timely and clear so individuals can understand risks to make informed decisions about their safety.

Levee Safety Program Principles

- 1) **Hold life safety paramount.** While seeking to manage flood risk to people, property, and the environment, USACE will consider risk to life safety as priority. The intent is that the interests of all in the leveed area are treated with fairness and the actions to reduce life-safety risk to all persons are given the same importance.
- 2) **Corporately manage risk.** Flood risks will be managed on a portfolio and individual levee system perspective using consistent and credible risk-informed processes. Decisions for risk management actions will be commensurate with the level of flood risk and to ensure wise federal investments.
- 3) **Ensure open and transparent engagement.** USACE will engage levee sponsors in all Levee Safety Program activities. USACE will build partnerships with levee sponsors and other stakeholders and provide opportunities to share in decisions. Risk communication will be accomplished in an open, transparent, and timely manner.
- 4) **Learn and adapt.** On a programmatic level, policies and procedures will be updated based on the evolution of best practices and science. **Flood risk is dynamic and will be managed on a continuous basis over time.**

Tenets of Mega-Project Management and Control

- Establish disciplined and focused supplemental governance structure
- Facilitated partnering
 - Evaluations
 - Periodic updates and IPRs
 - Enhanced project management plans
 - Enhanced project delivery team (PDT)
 - Use of lessons learned
 - Project senior executive accountability
 - MSC mega in-progress reviews (IPRs)
- Integrated master project schedule, cost estimate, risk analysis, and earned value
 - Project controls sub-team and metrics
 - Enhanced recruitment and staffing of project team members

Guiding Principles for **Sustainable** Federal Buildings

- Five Guiding Principles apply to existing buildings and new construction and major renovations:
 - Employ integrated design
 - Optimize energy performance
 - Protect and conserve water
 - Enhance indoor environmental quality
 - Reduce environmental impact of materials.

Sustainable Solutions

To America's Water Resource Needs

Civil Works Strategic Plan 2014-2018



US Army Corps
of Engineers®



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Plan At a Glance

Contribute to the strength of the Nation through innovative and environmentally sustainable solutions to the Nation's water resources challenges.

VISION

Contribute to the strength of the Nation through innovative and environmentally sustainable solutions to the Nation's water resources challenges.

MISSION

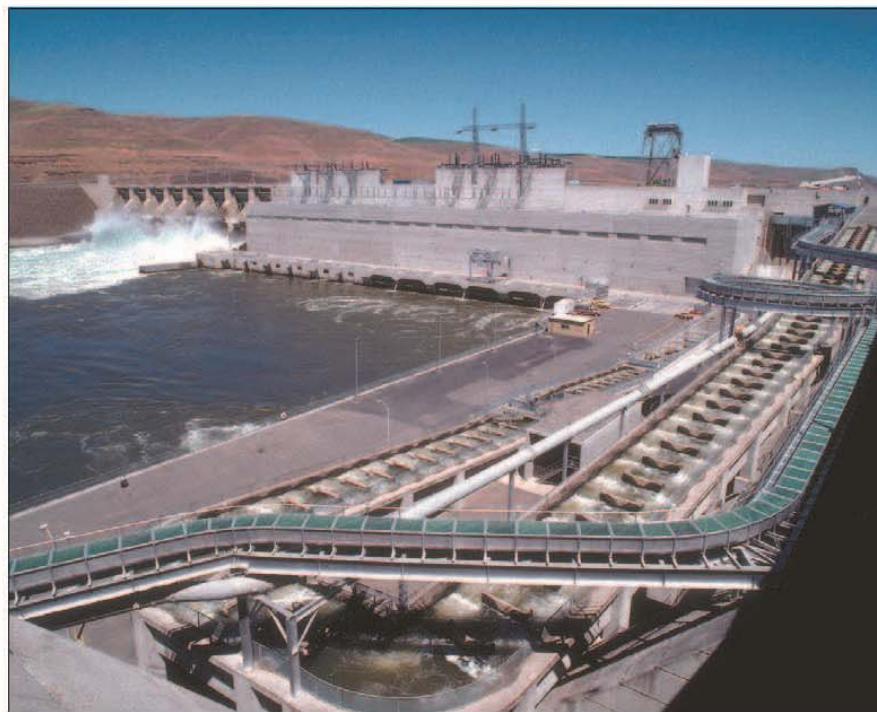
Serve the public by providing the Nation with quality and responsive:

- Development and management of the Nation's water resources;
- Support of commercial navigation;
- Restoration, protection and management of aquatic ecosystems;
- Flood risk management; and
- Engineering and technical services in an environmentally sustainable, economic, and technically sound manner with a focus on public safety and collaborative partnerships.

GOALS

How We Accomplish Our Mission

1. Transform the Civil Works Program to deliver sustainable water resources solutions through Integrated Water Resources Management.
2. Improve the safety and resilience of communities and water resources infrastructure.
3. Facilitate the transportation of commerce goods on the Nation's coastal channels and inland waterways.
4. Restore, protect, and manage aquatic ecosystems to benefit the Nation.
5. Manage the life-cycle of water resources infrastructure systems in order to consistently deliver sustainable services.



Sustainable Solutions to America's Water Problems **BUILDING STRONG®**



Achieving the Goals

Overarching Strategy: IWRM....holistic focus
...considers economic benefits, ecosystem quality, and health and public safety. These factors are considered in project formulation.

This strategic plan articulates five goals that will guide USACE into a 21st Century organization. Navigation, flood risk management, and aquatic ecosystem restoration remain the primary Civil Works missions. These missions are embedded in the five strategic goals presented above and discussed throughout the strategic plan.

These goals and strategies will help respond to the myriad of challenges facing the Civil Works Program. Goal 1 captures the transformational initiatives that address the current and future water resources needs of the Nation. Goal 2 includes the concepts of safety and resilience, and the intent to reduce economic and human life losses from floods. Goal 3 addresses the USACE navigation program, which provides safe, reliable, highly cost-effective, and environmentally sustainable waterborne transportation systems for the movement of commercial goods. Goal 4 focuses on restoring aquatic habitat to a more natural condition in those ecosystems whose structures, functions, and dynamic processes have become degraded. Goal 5 emphasizes adaptive operation and management of existing USACE projects throughout their life cycle. Reliability is also an element of this goal, and reflects the implementation of risk-based asset management in the area of operations and maintenance of USACE infrastructure.

OVERARCHING STRATEGY

Integrated Water Resources Management (IWRM) is a holistic focus on water resource challenges and opportunities that reflects coordinated development and management of water and related resources. IWRM considers economic benefits, ecosystem quality and health and public safety. These factors are considered in project formulation.

CROSS-CUTTING STRATEGIES

Systems Approach – Water resources planning and management should use systems analysis methods and tools to understand, assess, and model the interconnected nature of hydrologic systems (e.g., watersheds) and the economic and ecologic systems they support, and to identify and evaluate management alternatives from both time (life-cycle) and function (multi-purpose) perspectives.

Collaboration and Partnering – Build and sustain collaboration and partnerships at all levels to leverage authorities, funding, talent, data, and research from multiple agencies and organizations.

Risk-Informed Decision Making and Communication – Develop and employ risk and reliability-based approaches that incorporate consequence analysis, especially risk to life; identify, evaluate, and forestall possible failure mechanisms; and quantify and communicate residual risk.

Innovative Financing – Explore innovative financing arrangements such as public-private partnerships to develop and sustain the Nation's water resources infrastructure.

Adaptive Management – Adaptive management is a decision process that promotes flexible decision making that can be adjusted in the face of risks and uncertainties—such as those presented by climate change—as outcomes from management actions and other events become better understood through monitoring and improved knowledge.

State-of-the-Art Technology – Embrace new and emerging technology for its fullest advantage. Invest in research that improves the resiliency of structures, assists in updating design criteria, and improves approaches toward planning and design.

Goal 1:

Transform the CW Program to deliver sustainable water resources solutions through Integrated Water Resources Management (IWRM).



The New Moon...

This anthropogenically altered
terrestrial and maritime



Sustainable Security...
Sustainable Development...

CW Sustainability Initiative

Current Status, Progress & Development

- Vision and Mission
- Foundation Tenets
- Sustainable Values in Action (SVAs)
- Sustainable “Vision” doc
- Foundations of Sustainable CW
- Map of Sustainable Universe
- Sustainable Assessments (Start in FY16)

DRAFT



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Sustainable CW Vision & Mission

Vision

- A nation transformed by a new era of water resources management driven by the interdependence of human well-being, ecosystems, and national security.

Mission

- Through learning and adaptation, our agency actions and culture will sustain intergenerational well-being, preserve the public trust, buy down risks, and invest in resilience.



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CW Sustainability Initiative

Sustainability Values for Action (SVAs)

We recognize that water resources are systems.

We partner and collaborate to maximize value to the Nation.

We take a life-cycle view.

We conserve resources for efficiency.

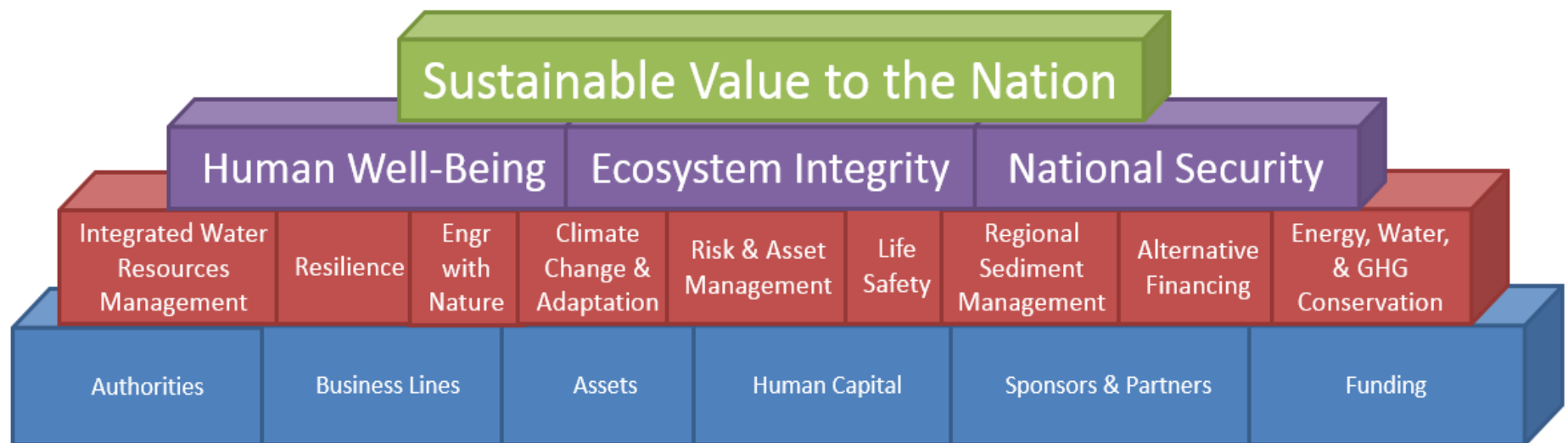
We seek opportunities to innovate & improve.



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Relationship between S & RSM

USACE Activities Building Toward Sustainability



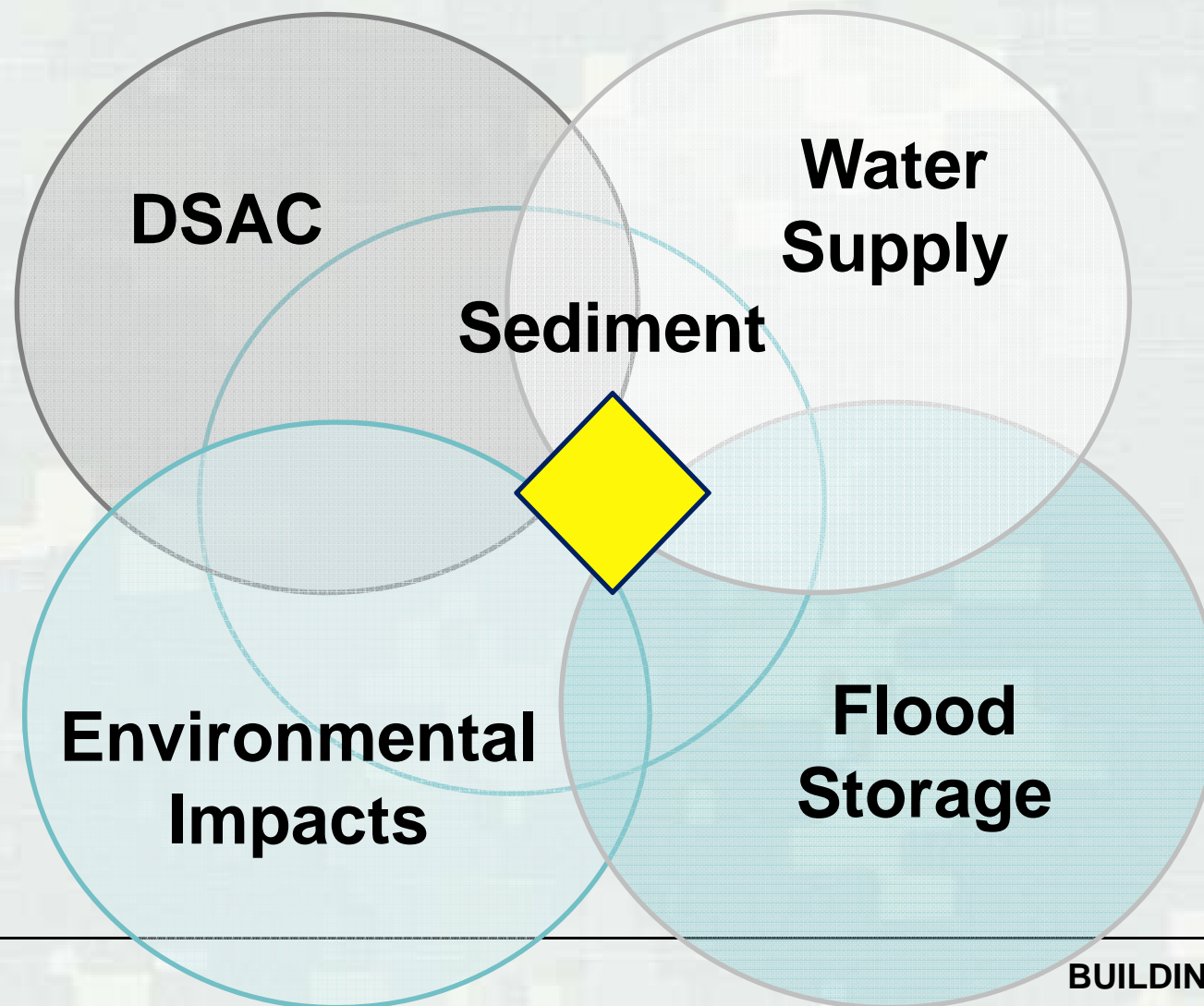
New Levels of Adaptive Capacity



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Reservoir Sustainability Plans

**** Paul Boyd, John Shelley and Stanford Gibson**



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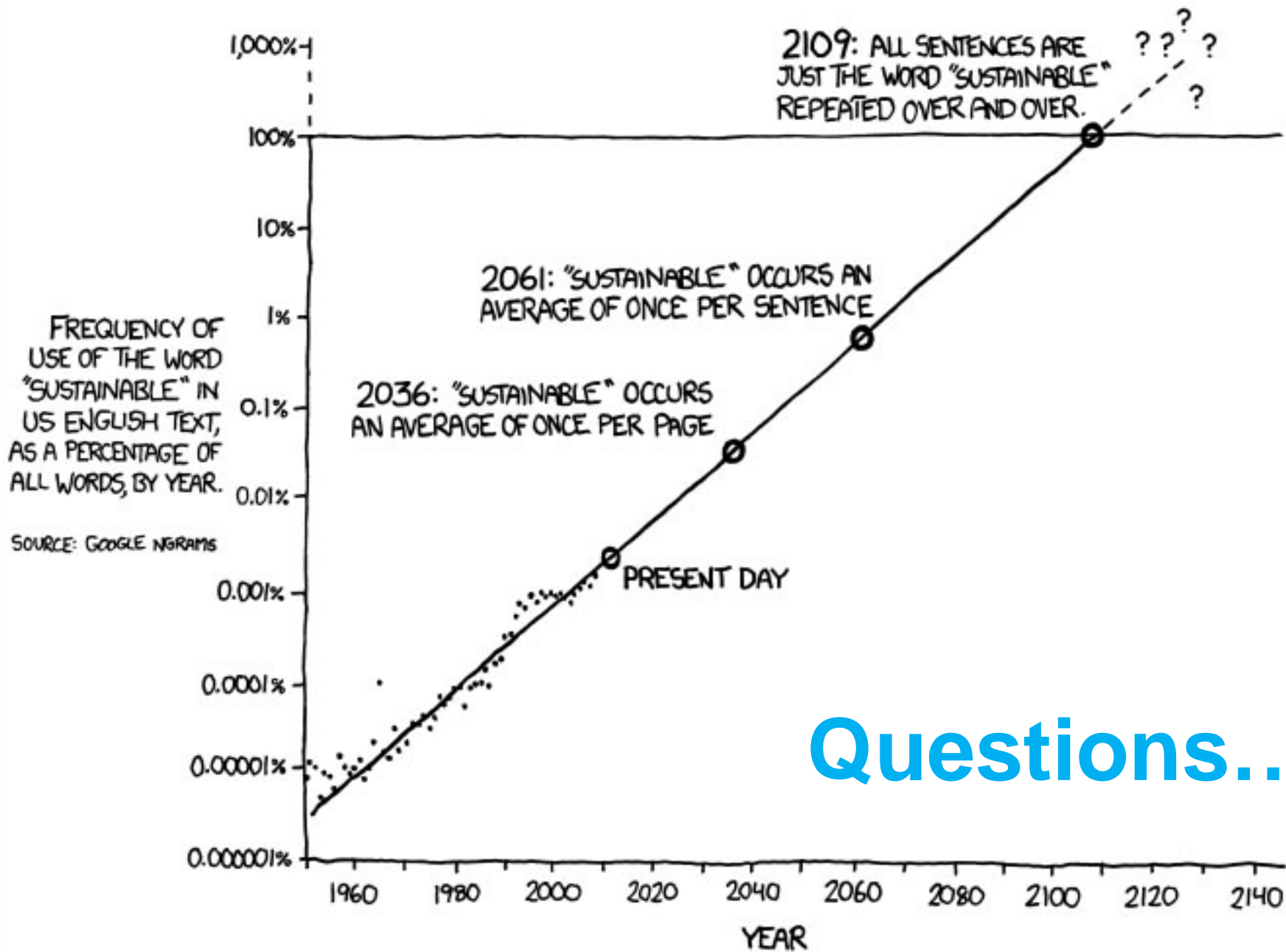
Reservoir Sustainability Plans

The basic framework will consider past, present, and future impacts from:

- sedimentation, safety, water supply capacity, and water demand, water quality, climate change, carbon management (and other GHG), resilience and other factors
- Objective: "determine the urgency, justification, and priority of actions required to sustain viability of our reservoirs".



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Questions...

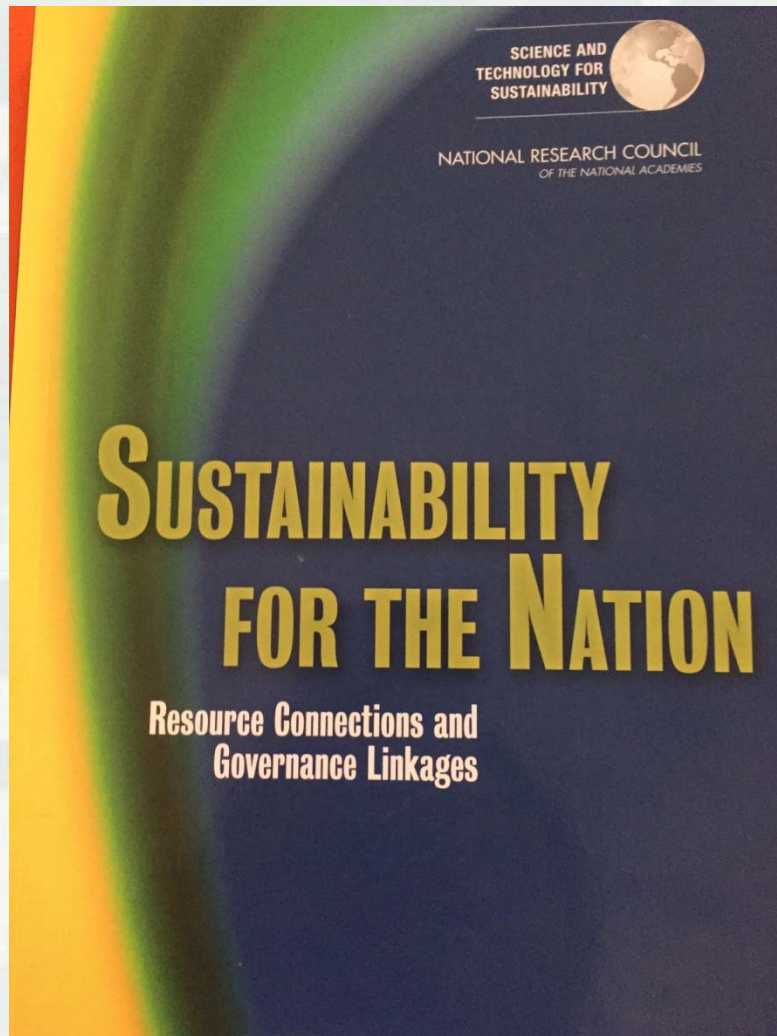
THE WORD "SUSTAINABLE" IS UNSUSTAINABLE.

Backup slides



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UNPACKING...



National Research Council of the National Academies

Why Sustainability?

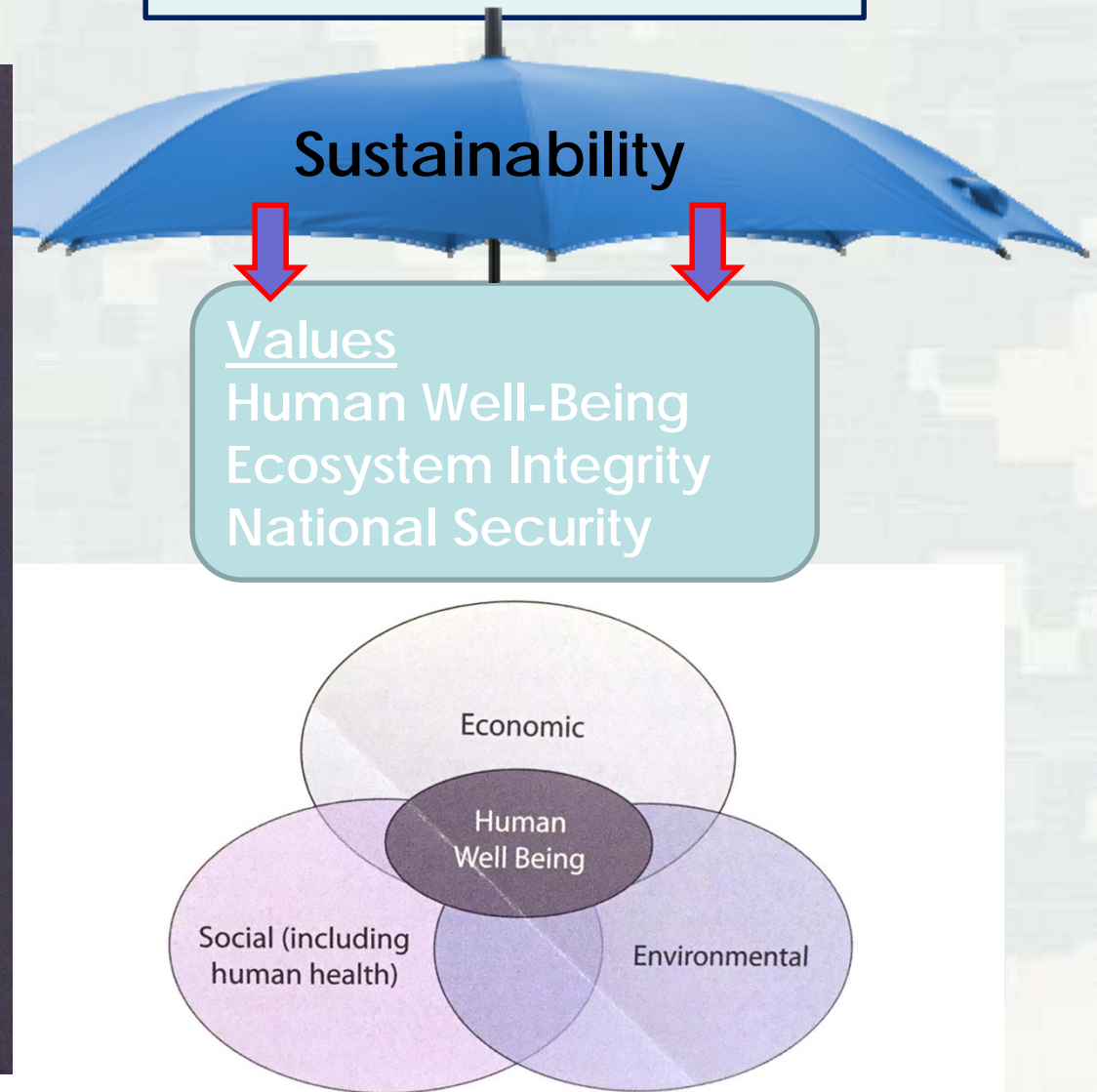
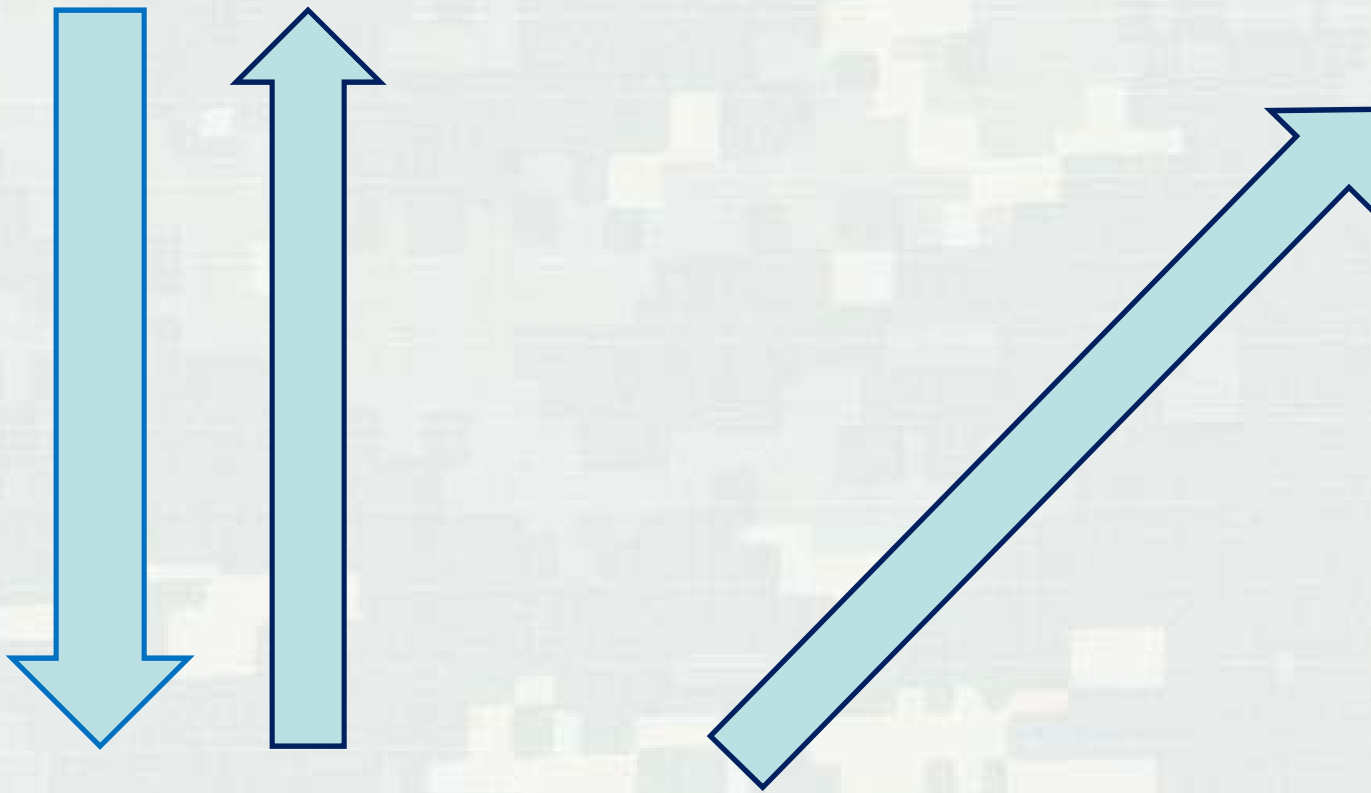


FIGURE 1-1 The components or domains of sustainability that support human well-being. SOURCE: National Research Council, 2011. Adapted from Figure 3-3, Hecht, 2010.

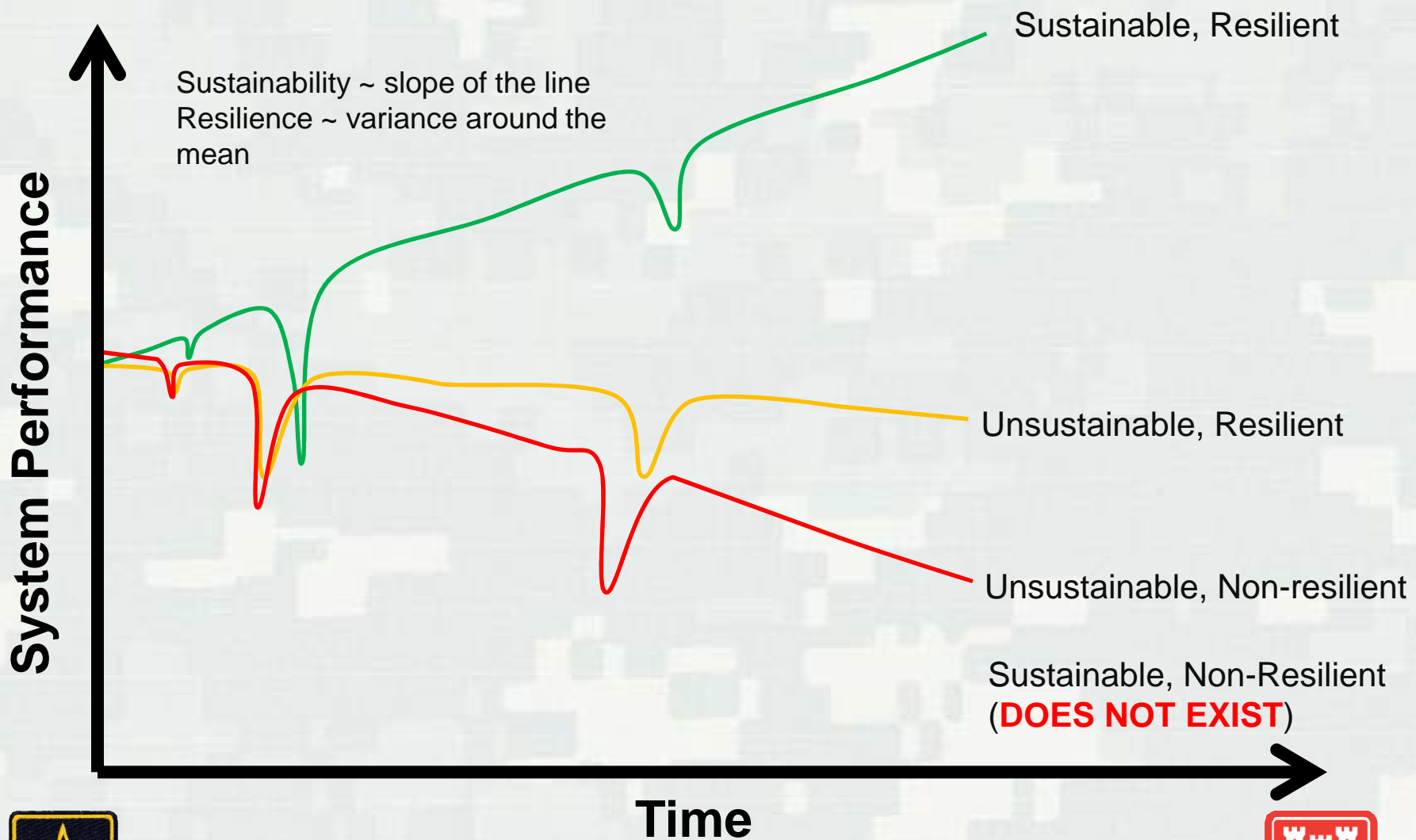
Relationship between S and R...



New Levels of Adaptive Capacity



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