Civil Works Sustainability

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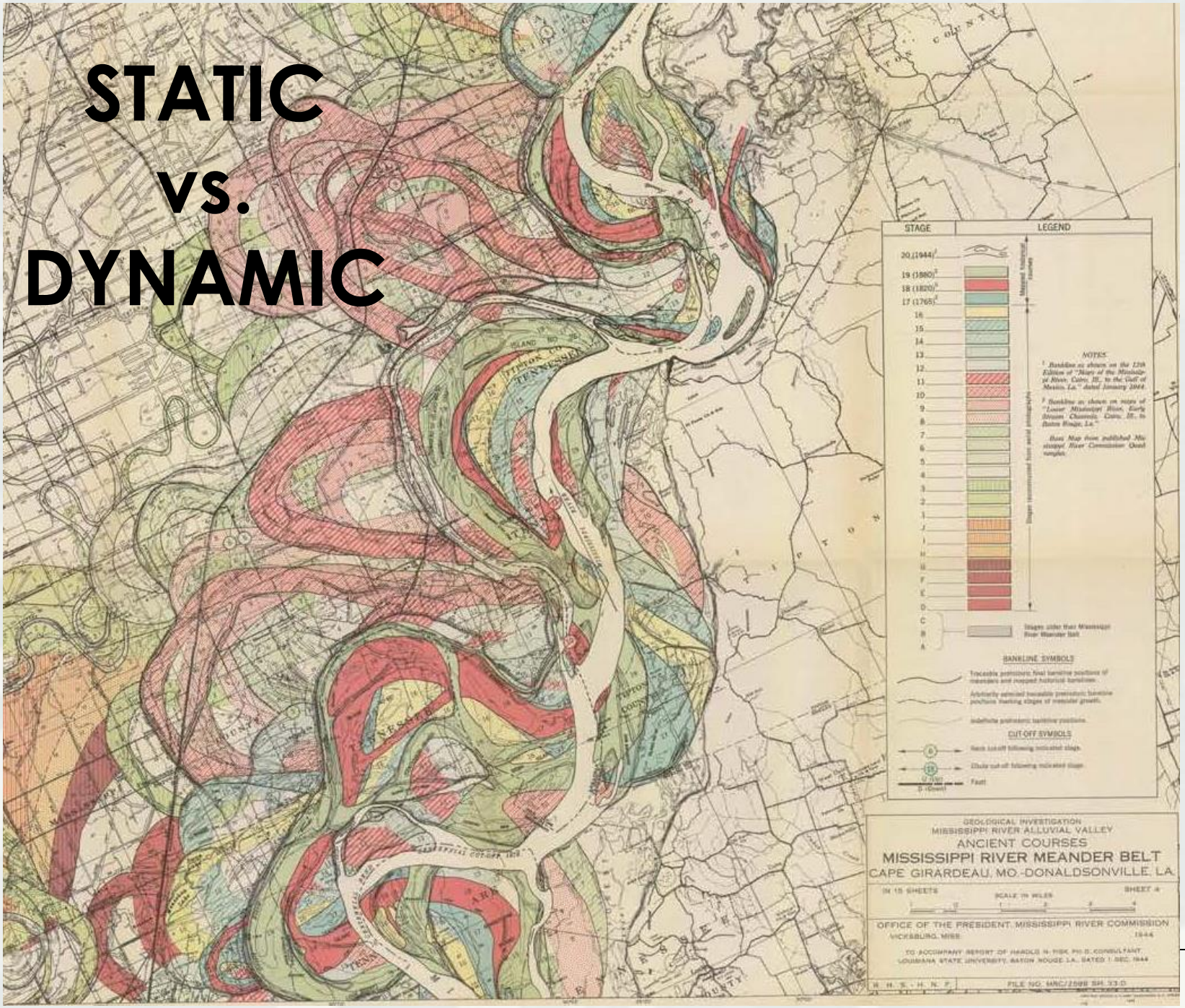
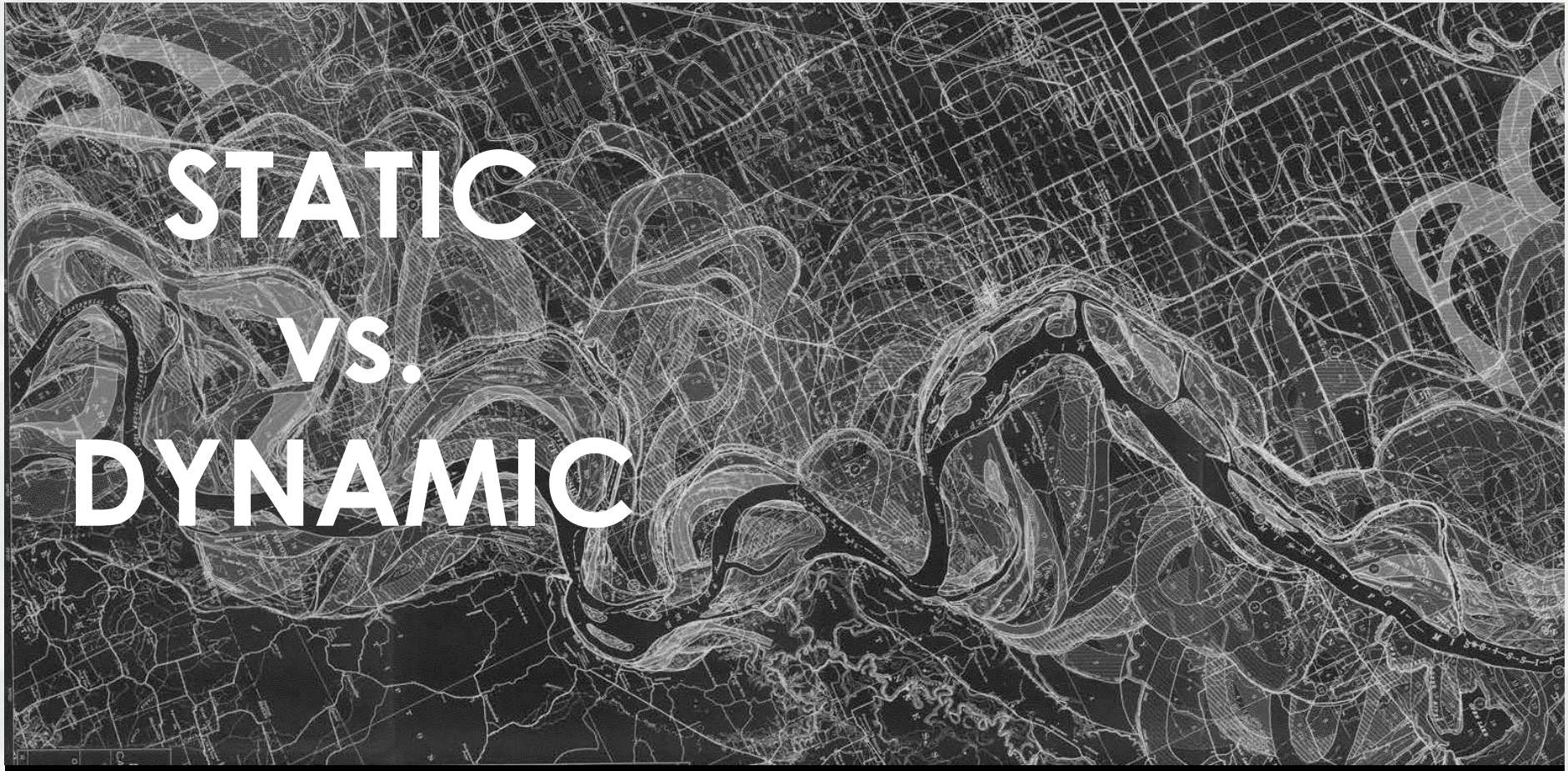
U.S. Army Corps of Engineers

7 January, 2015

US Army Corps of Engineers
BUILDING STRONG®

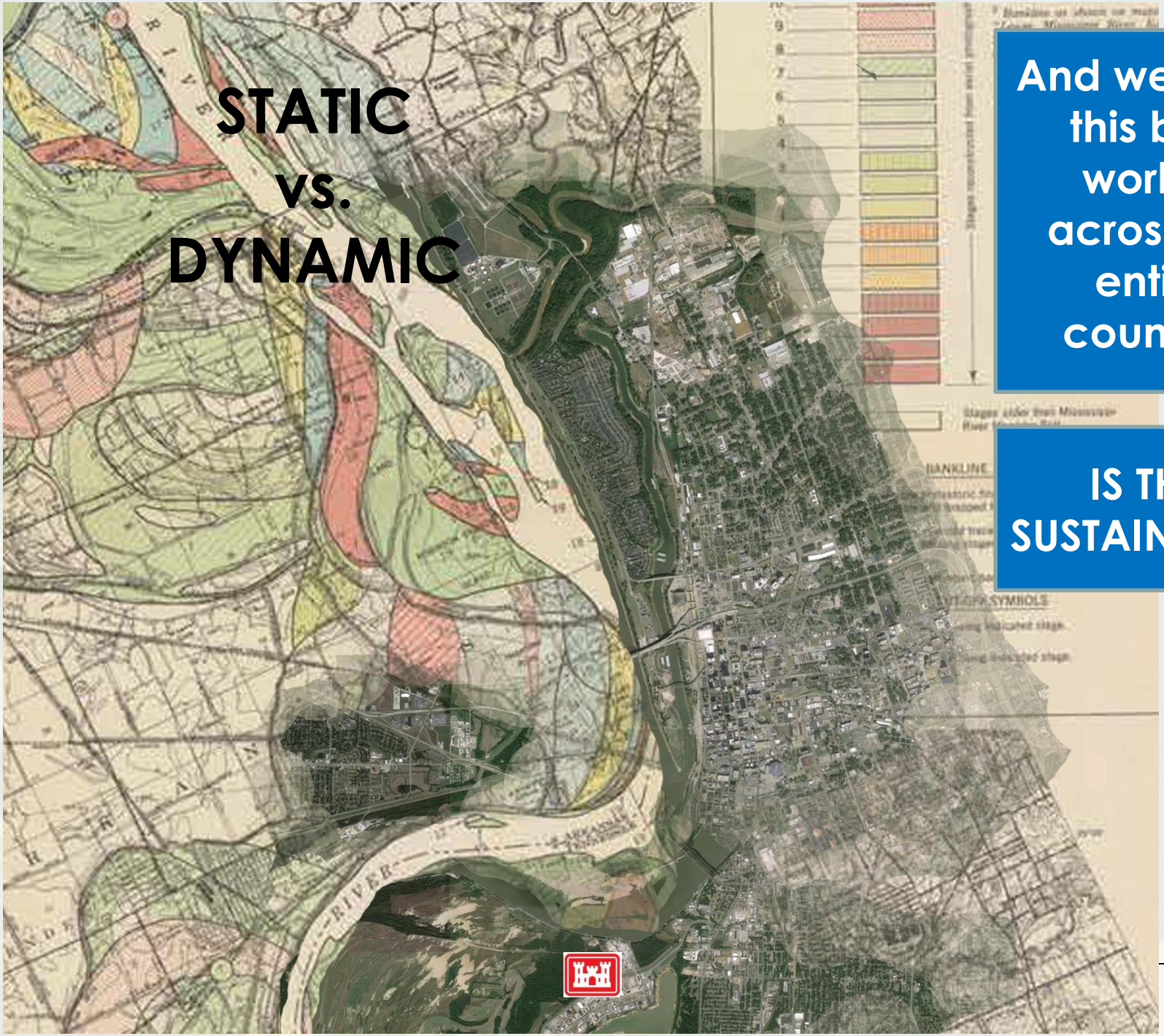

STATIC
vs.
DYNAMIC
STAGE
LEGEND
NOTES
BANKLINE SYMBOLS
CUT-OFF SYMBOLS
GEOLOGICAL INVESTIGATION
MISSISSIPPI RIVER ALLUVIAL VALLEY
ANCIENT COURSES
MISSISSIPPI RIVER MEANDER BELT
CAPE GIRARDEAU, MO.-DONALDSONVILLE, LA.
OFFICE OF THE PRESIDENT, MISSISSIPPI RIVER COMMISSION
VICKSBURG, MISS.
1944

STRONG®



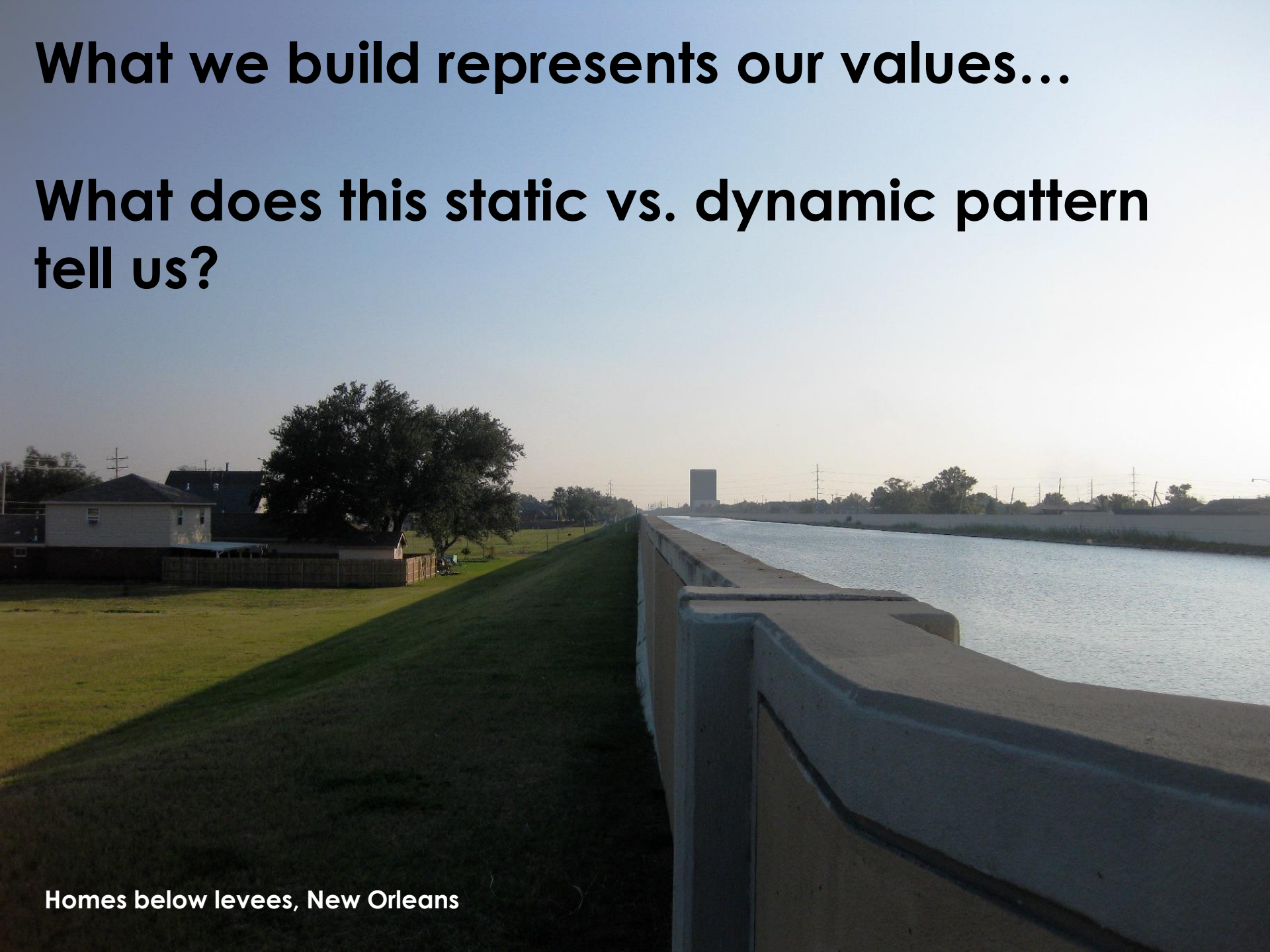
STATIC Measures on Dynamic water and landscapes

Creation of landscapes of both benefit and potential conflict for human habitation


STATIC
vs.
DYNAMIC
And we O&M this built work… across the entire country?
IS THIS SUSTAINABLE?
STRONG®

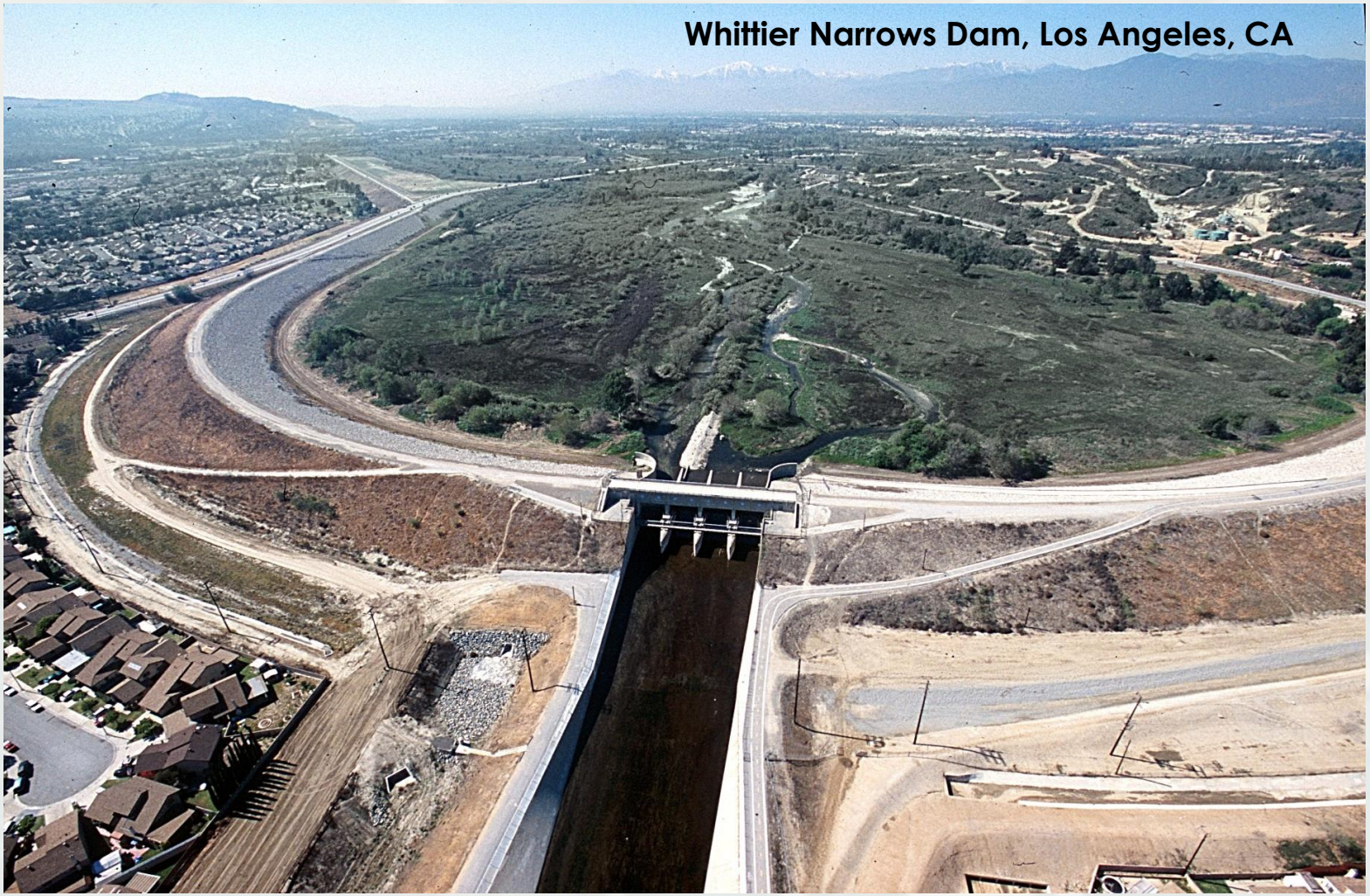
What we build represents our values…

What does this static vs. dynamic pattern tell us?

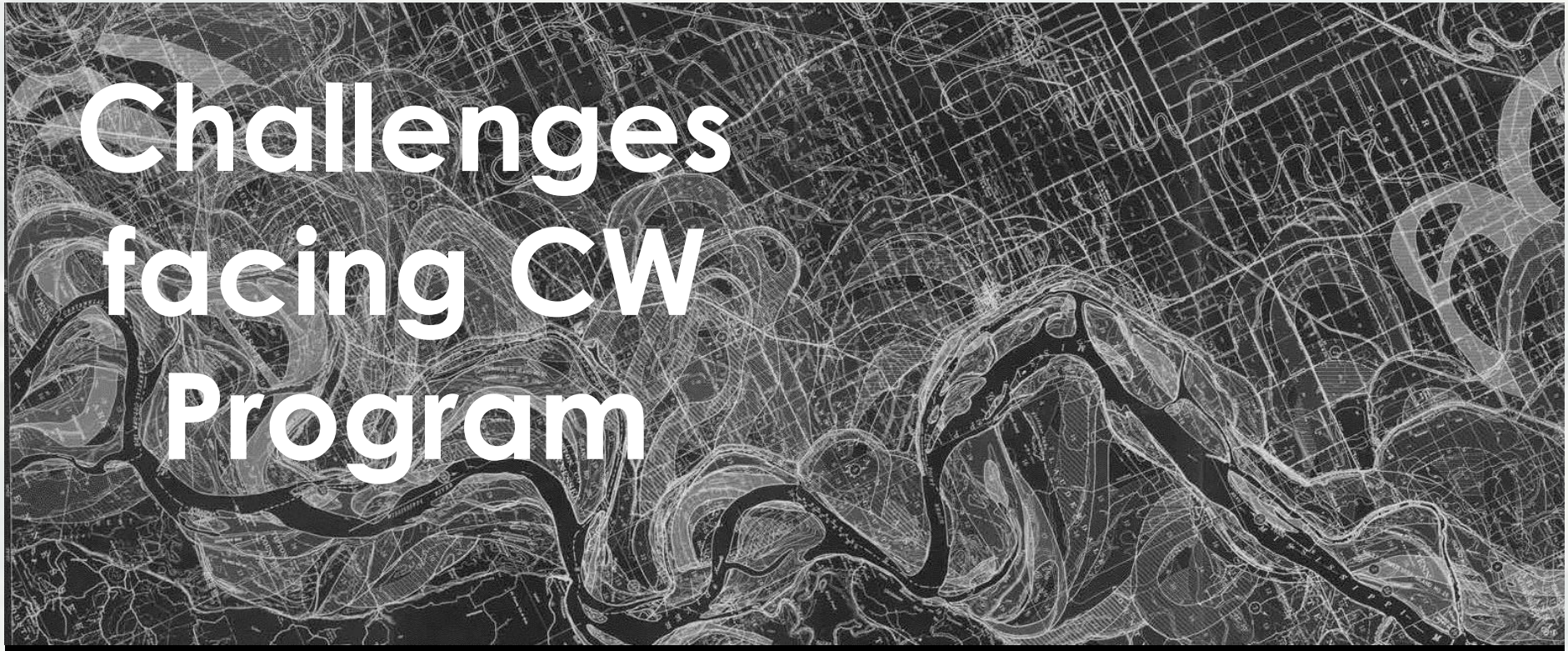


Homes below levees, New Orleans

What is our relationship with Civil Works?



Challenges facing CW Program

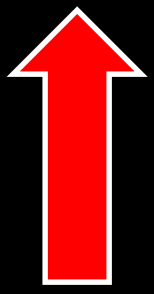


Polarized political landscape + Restrictive fiscal landscape + Climate variability, water supply draught, groundwater extraction, cities subsidence etc… +

Has America developed a culture informed of water infrastructure? Consumptive and disposal ease? Over expenditure of finite resources?

=

CW Planning responsibility goes up



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

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

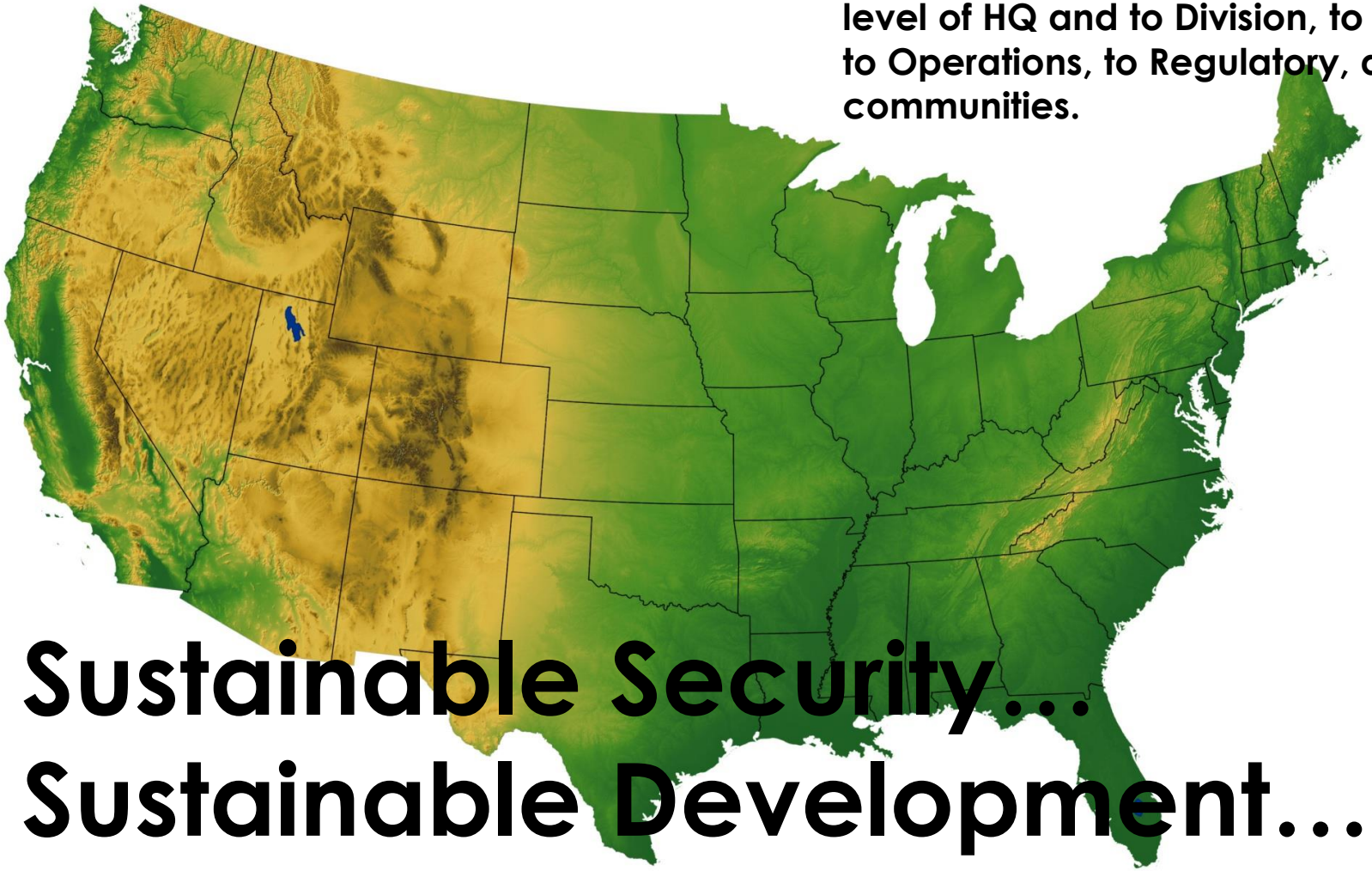
Not climate controlled

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 level of HQ and to Division, to the District, to Operations, to Regulatory, and to communities.



Sustainable Security…
Sustainable Development…

STRONG®

Scales of CW Sustainability Implementation

SCALES OF CW SUSTAINABILITY IMPLEMENTATION
Higher elevation = Larger horizontal application

S
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
IWR: Actions for Change
Watershed Informed Budgeting
Energy, Sustainable Policy, Circulars, USGBC (ie, sea level rise)
Silver Jackets Program

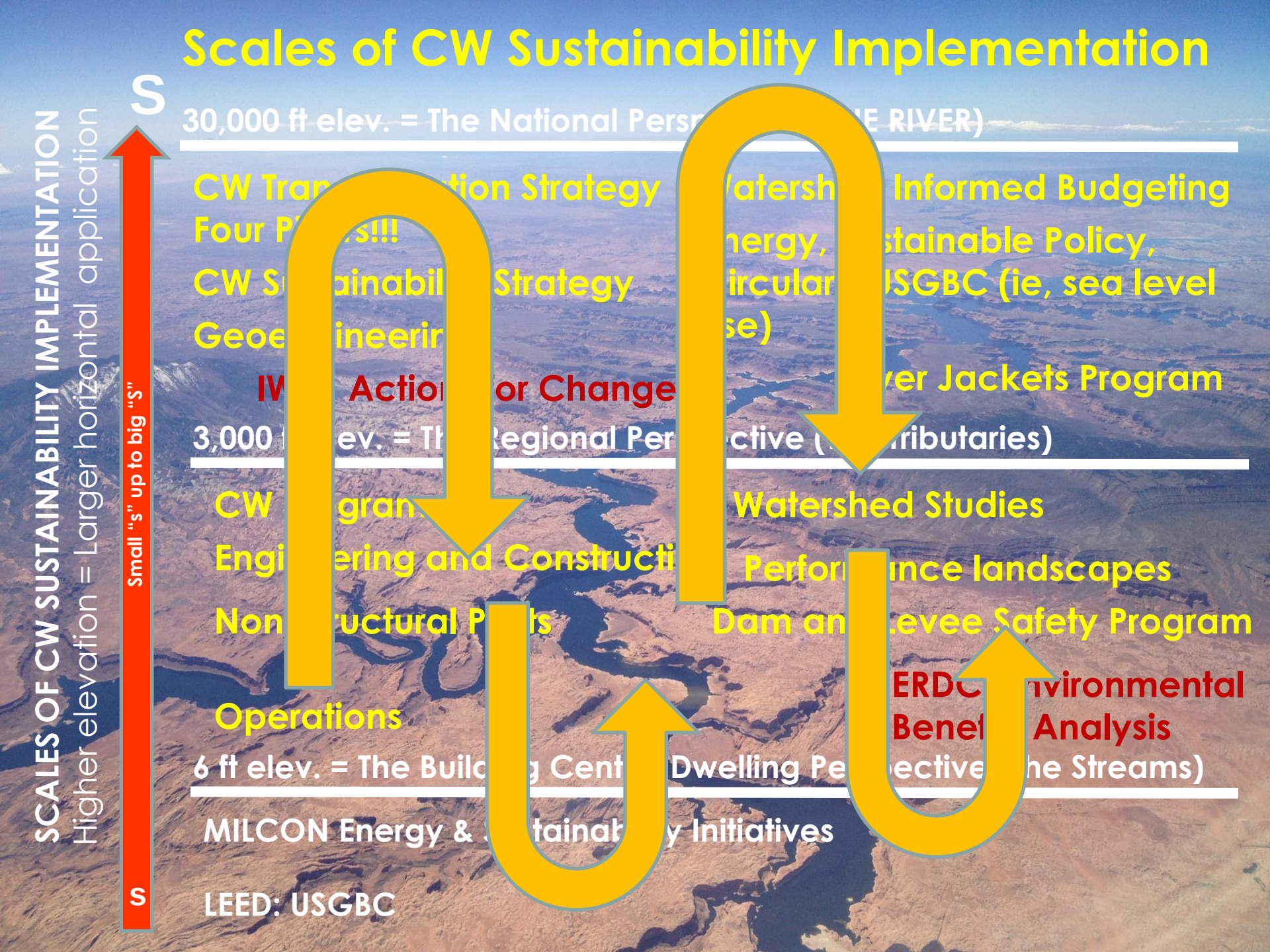
3,000 ft elev. = The Regional Perspective (The Tributaries)

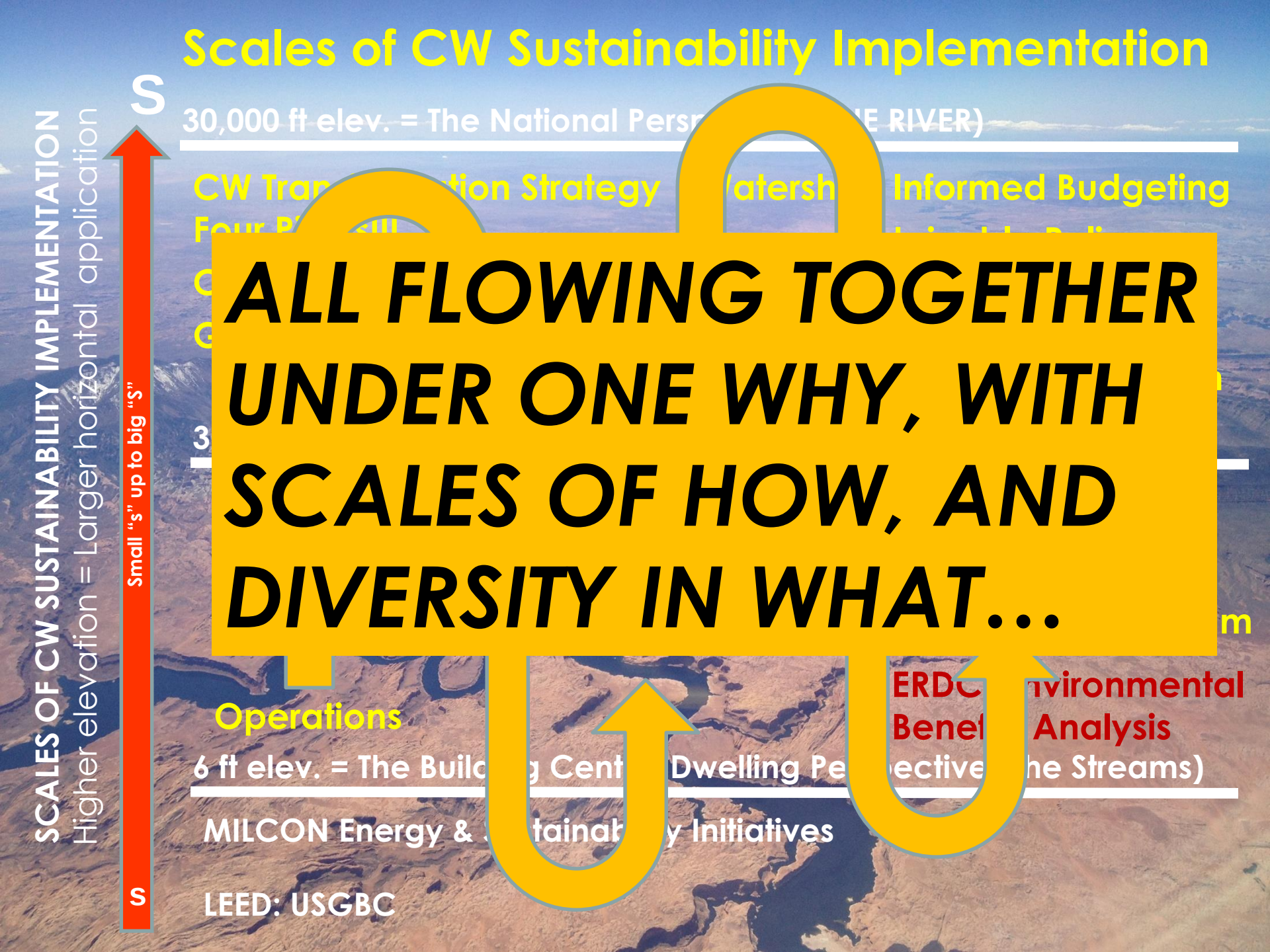
CW Program
Engineering and Construction
Non-Structural Pilots
Watershed Studies
Performance landscapes
Dam and Levee Safety Program
Operations
USACE Sustainability Plan
ERDC: Environmental Benefits Analysis

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

MILCON Energy & Sustainability Initiatives
Sustainable Buildings Policy for CW
LEED: USGBC

Scales of CW Sustainability Implementation




Scales of CW Sustainability Implementation
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30,000 ft elev. = The National Persp E RIVER)
CW Tra tion Strategy atersh Informed Budgeting
ALL FLOWING TOGETHER UNDER ONE WHY, WITH SCALES OF HOW, AND DIVERSITY IN WHAT…
Operations
ERDC nvironmental
Benef Analysis
6 ft elev. = The Build g Cent Dwelling Pe ective he Streams)
MILCON Energy & tainab y Initiatives
LEED: USGBC

Civil Works Sustainability:

Discovered…

TIME + INTERACTION, RESEARCH, COLLABORATION + ENERGY +

EXISTING EFFORTS INPUT =

Sustainability is integral and already resides in many ongoing initiatives and activities at the agency

Agency Efforts:

CWT

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.erdc.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.

http://www.usace.army.mil/Missions/Environmental/EnvironmentalOperatingPrinciples.aspx

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)

USACE. 2014. Program management plan (PgMP) for Civil Works asset management: 2014-2017.

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.

http://www.usace.army.mil/Missions/CivilWorks/DamSafetyProgram/ProgramPrinciples.aspx

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

USACE. 2014. Engineering and Construction Bulletin 2014-14.

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.

http://energy.gov/eere/femp/guiding-principles-sustainable-federal-buildings

Sustainable Solutions

To America's Water Resource Needs

Civil Works Strategic Plan 2014-2018

US Army Corps of Engineers®

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

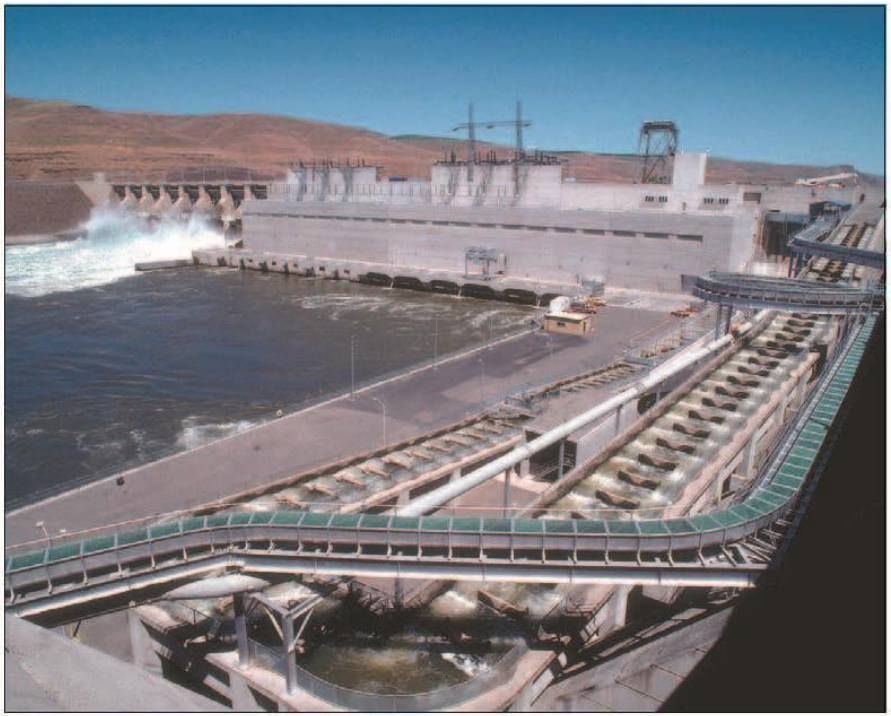
Serve the public by providing the Nation with quality and responsive:

- 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.



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.

Foreward

For more than 230 years, the U.S. Army Corps of Engineers (USACE) has been a leader in developing the Nation's water resources and related activities to include harbors and waterways. The Directorate of Civil Works is a major component of the USACE. The Civil Works programs include water resource development activities including flood risk reduction, navigation, recreation, environmental stewardship and emergency response to name a few. As USACE moves through the 21st Century, it will continue to advance the Civil Works Program strategic goals: transforming the Civil Works program; assisting in providing for safe and resilient communities and infrastructure; helping facilitate commercial navigation in an environmentally and economically sustainable fashion; restoring degraded aquatic ecosystems and preventing future environmental losses; and implementing effective, reliable, and adaptive life-cycle performance management of infrastructure.

As society's needs and values have changed, the Army Civil Works mission has evolved from one of primarily development and management of water resources to one that inherently includes protection and restoration of water resources and the ecosystems they support. USACE has implemented water resources programs and projects that strengthened America's economic competitiveness; reduced risks from floods and hurricanes; helped people recover more quickly from disasters; restored, protected and sustained the aquatic environment, including wetlands; provided American homes and communities with water, power, recreational opportunities, and natural resources for citizens to enjoy and appreciate.

A particular strength of USACE is the synergy between its civil and military operations. Beyond the direct contribution that the Army Civil Works Program makes to domestic economic development and environmental security, USACE also applies its Civil Works expertise to support defense missions, such as operations that promote peace and stability around the globe. In

turn, the USACE derives increased depth and broader experiences from operations in international areas by being an integral part of the larger Army and Defense organizations. USACE has demonstrated this synergy most recently in post-disaster responses following Hurricanes Sandy and Irene and post-conflict stability operations in Afghanistan.

USACE must operate and manage existing water infrastructure in a manner that meets the Nation's contemporary water resources needs, and adapts to changing conditions such as climate change and de-

mographic shifts to ensure such resources are available for future generations. Competing water uses must be balanced to provide multiple benefits such as economic security, environmental health, social well-being, and public safety. For example, navigation projects must be designed and operated to safely and efficiently convey vessels and cargo to ports and waterways, and also minimize any adverse impacts to the environment. Flood damage reduction projects must simultaneously reduce flood risks and sustain healthy ecosystems.

Federal, state, local and private partnerships, along with increased stakeholder and non-governmental collaboration, can be used to develop sustainable solutions to today's complex water resources development and management challenges. A strategy to deal with these complex and changing conditions is Integrated Water Resources Management (IWRM), which is essential for the future success of the Army Civil Works Program given the Nation's multi-layered governance system that crosses watershed boundaries, and the interdependent relationship between the natural and built environment. This strategy will address key external forces such as climate change, demographic and associated land use changes, resource constraints and focus on implementation of innovative and resilient solutions to the Nation's water resources planning and management challenges.

This strategic plan recognizes that USACE must continually develop and apply a diverse range of planning, problem solving, and evaluation strategies while broadening its knowledge, skills, and talents. The USACE must be both a leader and a partner in these efforts. This strategic plan presents USACE's commitment to responsibly develop the Nation's water resources, while protecting, restoring and sustaining environmental quality. USACE is dedicated to learning from the past and adapting the organization to meet the Nation's water resources needs.

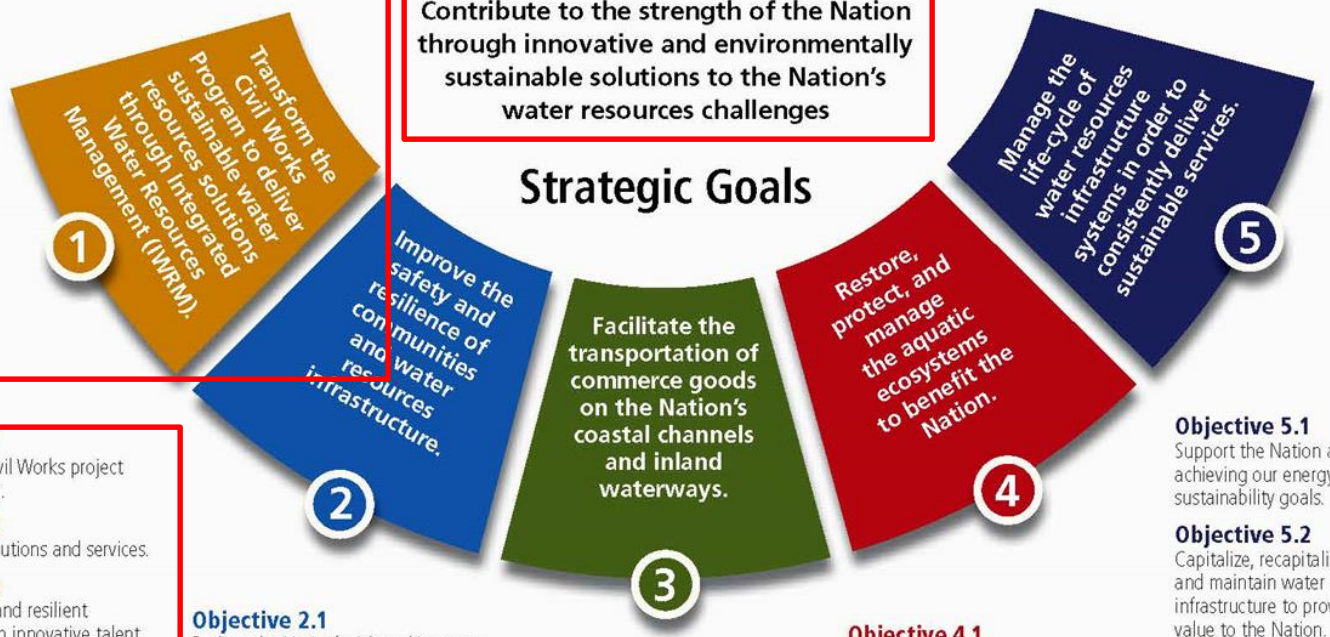
Jo-Ellen Darcy
Assistant Secretary of the Army for Civil Works

Thomas P. Bostick
Lieutenant General, USA
Chief of Engineers

USACE Civil Works Vision

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

Strategic Goals



Objective 1.1
Modernize the Civil Works project planning program.

Objective 1.2
Deliver quality solutions and services.

Objective 1.3
Develop a ready and resilient workforce through innovative talent management and leader development strategies and programs.

Objective 2.1
Reduce the Nation's risk and increase resilience to disasters.

Objective 2.2
Support the Department of Homeland Security/Federal Emergency Management Agency to provide life-cycle public works and engineering support in response to disasters.

Objective 2.3
Effectively and efficiently execute response, recovery, and mitigation.

Objective 3.1
Facilitate commercial navigation by providing safe, reliable, highly cost-effective and environmentally sustainable waterborne transportation systems.

Objective 4.1
Restore aquatic habitat to a more natural condition in ecosystems in which structure, function, and dynamic processes have been degraded.

Objective 4.2
Reduce adverse impacts to the Nation's wetlands and waterways through an effective, transparent, and efficient Regulatory process.

Objective 4.3
Clean up radioactive waste sites.

Objective 4.4
Manage, conserve, and preserve natural resources at USACE projects.

Objective 4.5
Provide opportunities for quality outdoor public recreation.

Objective 5.1
Support the Nation and the Army in achieving our energy security and sustainability goals.

Objective 5.2
Capitalize, recapitalize, operate and maintain water resources infrastructure to provide maximum value to the Nation.

Objective 5.3
Provide reliable, renewable, hydropower to the Nation.

Objective 5.4
Provide water supply storage in partnership with state and local interests.

Example: Sustainability is a part of "delivery quality solutions" so develop procedures guidance and performance metrics for sustainability with the LONG term goals in mind

Example: of an action of how sustainability could be pulled through the objective: Develop material and guidelines for Planning and National Planner Certification.

Civil Works Sustainability: discoveries…

1) If Sustainability is so integral, why are we not doing it at all scales yet?

2) We need to expand how to develop long term goals, and look long term.

3) We don't know how to use our short terms goals project/resources/approaches to get us to the long term goals…like Sustainability.

4) ALL of these efforts are requesting a real form of integration?

Civil Works Sustainability: discoveries…

3) IF we do not know the relationships between the efforts, we cannot figure out how to integrate them, let alone actively participate, development and support evolve them.

4) Is IWRM at full scale in CW?…do we need a framework to stretch its "tactile dexterity?"

5) Sustainability principles are there to potentially guide the actions to integrate and carry out the CW Strategic Plan.

6) The action of the CWS Team are potentially being organized to address the objectives and performance measures.

Civil Works Sustainability:

Further discovery…

Can't implement sustainability (or other important initiatives) until our agency is more integrated itself.

Major impediments to CW Sustainability?

Impediments to CWS:

1) NED Plan Selection: we do not use this as a tool to compare plans, we use it as an end game.

2) Lack of multi-purpose projects

"All of our projects affect multiple purposes, so this is a redundant and unnecessary dichotomy. There should not be "multi-purpose projects"; there should only be "projects." Kyle McKay ERDC.

3) Scope to fit the sponsors needs, rather than the needs of the entire system.

4) No Remaining Item that is structured to reflect our priority of Integrated WRM.

6) No comprehensive approach to our Remaining Items.

Impediments to CWS:

7) Construction Budget process is BCR driven. FRM no < than 2.5 BCR and/or life safety…what if lower BCR but many other benefits and more sustainable?

8) Business Line funding is not integrated. – so we can't do concepts such as Watershed Budgeting.

9) Lots of efforts to evoke change and evolve the agency, but not strategically coordinated or based on a new set of values to change behavior and agency culturally identity. Ex. SMART

10) When a value shift is negated, the design output for E&C will not reflect the needed adaptation.

Impediments to CWS:

11) We do not have adaptability in our goals and objectives, we will not have adaptation in our designs.

12) If we have fixed and static benefits that we use to justify the project, we are preventing future adaptability.

12) We don't do adaptive management at the scale we should or can…for ourselves, infrastructure, planning process, design, and operations.

13) Life Cycle Management cannot be and is not being fully utilized.

Impediments to CWS:

14) Cannot justify cost intensive solutions upfront would provide long term return on investment.

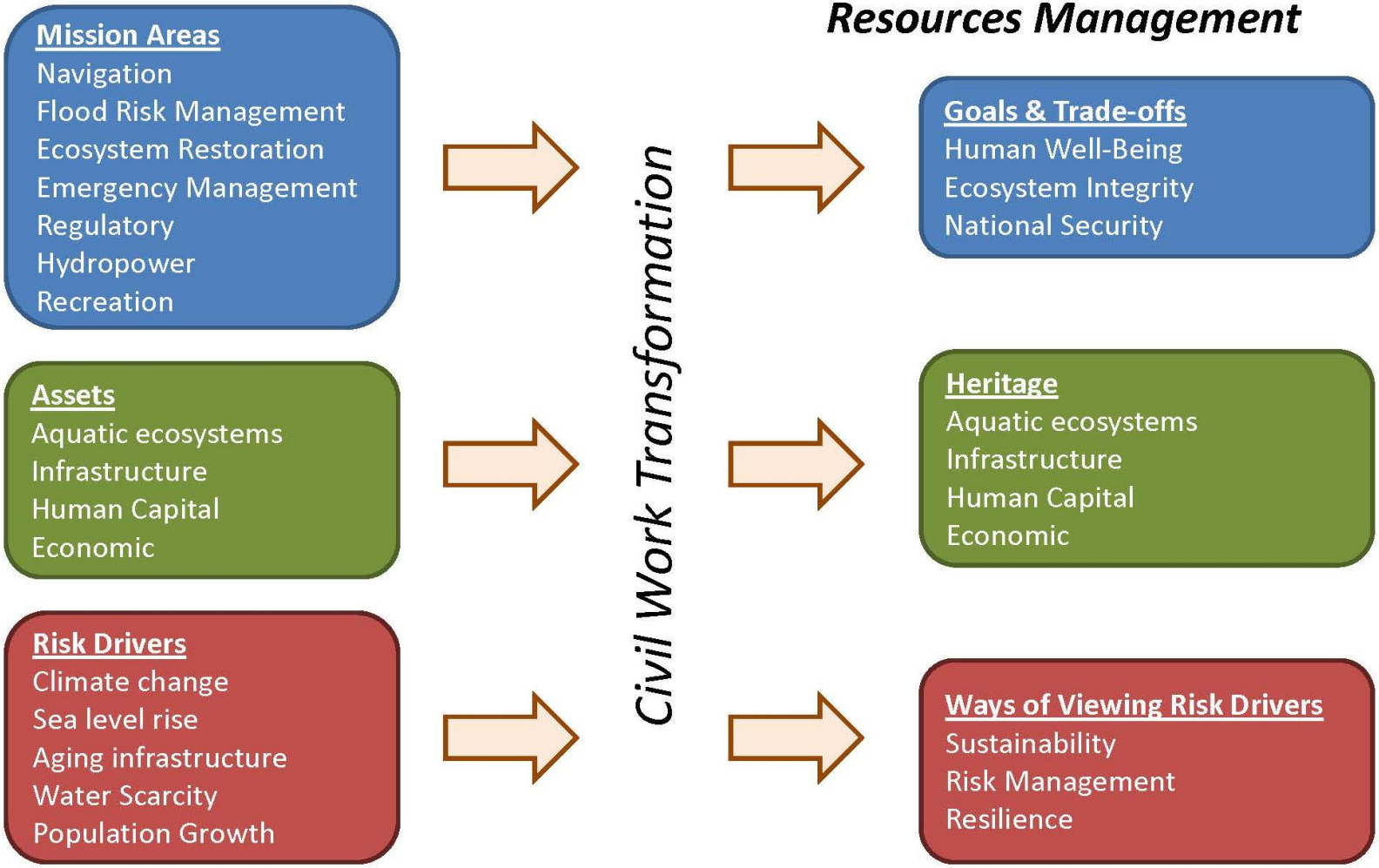
15) Value-Engineering is defined in dollars and not sustainable values. “Value” needs to be evolved.

CRUX of CW Sustainability

Solving these impediments to get USACE flowing.

Enter…a new framework for integration and action…?

A New Era of Integrated Water Resources Management



A New Era of Water Resource Management

Why Sustainability?

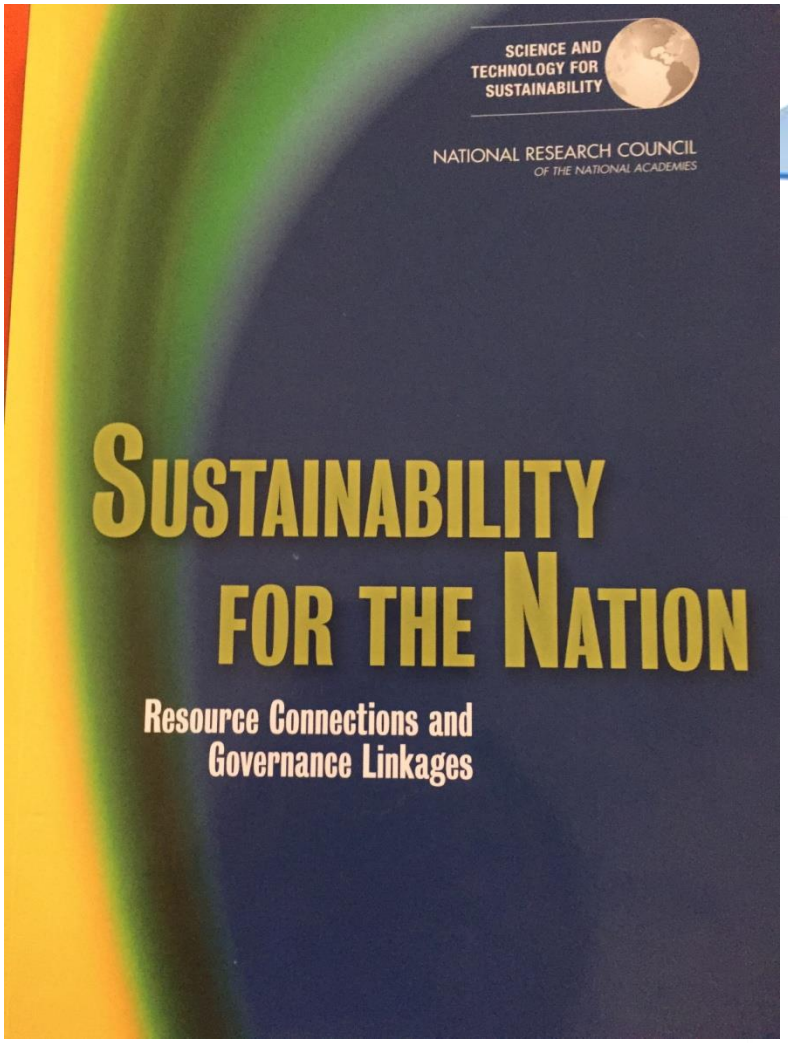
Is about long term goals – It's the ultimate goal – to sustain the nation

<u>Values</u>
Human Well-Being
Ecosystem Integrity
National Security

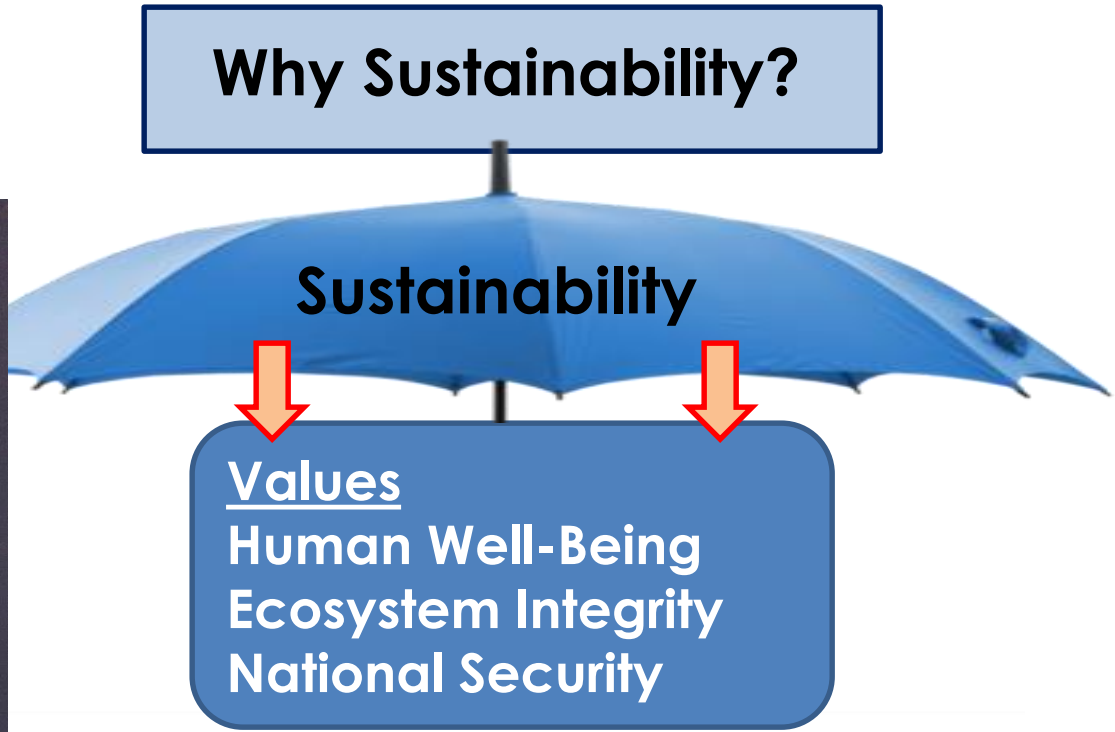
Integral to many efforts and directives in agency

Serve as catalyst to create integration, strengthen and give support to all the agency outcomes and efforts listed

UNPACKING…



National Research Council of the National Academies



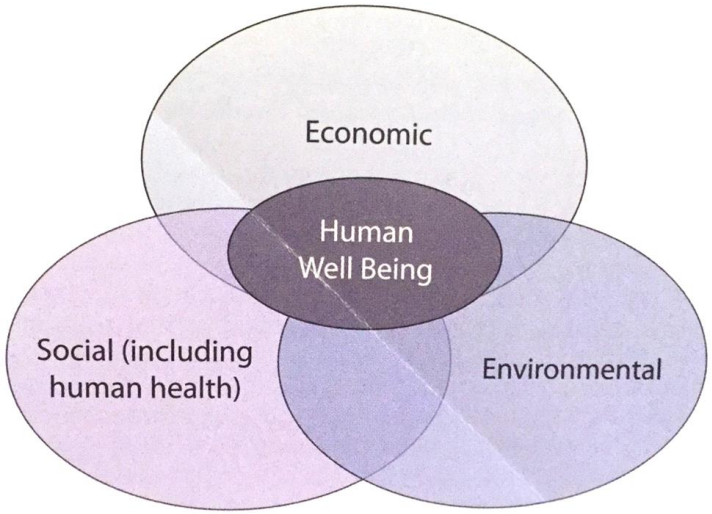


FIGURE 1-1 The components or domains of sustainability that support human well-being. SOURCE: National Research Council, 2011. Adapted from Figure 3-3, Hecht, 2010.

Race to the Moon…

The New Moon…

This anthropogenically altered terrestrial and maritime

Sustainable Security…
Sustainable Development…

The Cross-Cutting

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

Risk Management

- Asset Management
- Safety Programs
- Engineering & Construction
- Programs
- Climate Adaptation
- Infrastructure Strategy
- Planning
- Operations
- Planning Modernization
- Resilience
- Budget

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.

Sustainable Civil Works Principles

1) *A systems approach is requisite, not optional*
2) *Intergenerational heritage is our focus*.
3) *Society and the environment are a part of, not apart from economic outcomes*.
4) *Sustainable systems are resilient to disturbances*.
5) *The process for water resource decision making influences the outcome*
6) *Foreclosing future options is risky*.
7) *Individual choices and behavior matter.*
8) *Dynamism and adaptation are the norm*.

CW Sustainability: *Now, Near & Horizon*

- **Refine Vision, Mission, Principles: unpack the “why” at this scale**
- **FY16: Develop further CWS Strategy and PMP and 1,2,3 Tier actions**
- **FY16: Identify Sustainable Assessments: tangible application of sustainability**
- **Revisit Guiding Principles and informed way ahead**

Questions?

Type questions in the chat box.
We will answer as many
as time allows.

For more information:
http://www.corpsplanning.us