STATIC vs. DYNAMIC
BUILDING STATIC vs. DYNAMIC

Creation of Static landscapes of measures on both benefit and dynamic potential conflict for human habitation.
STATIC vs. DYNAMIC

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

IS THIS SUSTAINABLE?
What we build represents our values…

What does this static vs. dynamic pattern tell us?
What is our relationship with Civil Works?
Challenges facing CW Program

Polarized Climate variability, Restrictive political water supply draught, fiscal landscape groundwater extraction, etc... Has America developed a culture informed of water CW Planning? Infrastructure responsibility? Consumptive and disposal goes up ease? Over expenditure of Planning Engineering = 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®
Three SCALES...

3,000FT elevation:

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

Wittier Narrows, CA (Los Angeles)
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 Operations, to communities.

30,000FT elevation:
Scales of CW Sustainability Implementation

30,000 ft elev. = The National Perspective (THE RIVER)
- CW Transformation Strategy
- Four Pillars!!!
- CW Sustainability Strategy
- Geoengineering

3,000 ft elev. = The Regional Perspective (The Tributaries)
- CW Program
- Engineering and Construction
- Non-Structural Pilots

6 ft elev. = The Building Centric Dwelling Perspective (The Streams)
- MILCON Energy & Sustainability Initiatives

Scales of CW Sustainability Implementation

Higher elevation = Larger horizontal application
- Small “s” up to big “S”

30,000 ft elev. = The National Perspective (THE RIVER)
- CW Transformation Strategy
- Watershed Informed Budgeting
- Four Pillars!!!
- Energy, Sustainable Policy, Circulars, USGBC (ie, sea level rise)

3,000 ft elev. = The Regional Perspective (The Tributaries)
- CW Program
- Watershed Studies
- Engineering and Construction
- Performance landscapes
- Non-Structural Pilots
- Dam and Levee Safety Program

6 ft elev. = The Building Centric Dwelling Perspective (The Streams)
- MILCON Energy & Sustainability Initiatives
- Sustainable Buildings Policy for CW
- LEED: USGBC

ERDC: Environmental Operations USACE Sustainability Plan
- Benefits Analysis

IWR: Actions for Change
- Silver Jackets Program

Scales of CW Sustainability Implementation

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- Silver Jackets Program
Scales of CW Sustainability Implementation

Higher elevation = Larger horizontal application

BUILDING STRONG
30,000 ft elev. = The National Perspective (THE RIVER)
3,000 ft elev. = The Regional Perspective (The Tributaries)
6 ft elev. = The Building Centric Dwelling Perspective (The Streams)

CW Transformation Strategy
Four Pillars!!!

SMILCON Energy & Sustainability Initiatives
LEED: USGBC
Small “s” up to big “S”

CW Sustainability Strategy
Circular USGBC (ie, sea level rise)

IV Action for Change

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

CW Program Operations

Watershed Studies

Engineering and Construction Performance landscapes

Non-Structural Pilots

Dam and Levee Safety Program

Silver Jackets Program

IWR: Actions for Change

ERDC: Environmental Benefits Analysis

Geoengineering

Operations
ALL FLOWING TOGETHER

SCALES OF HOW, AND

Operations

ERDC: Environmental Benefits Analysis
New Era of Water Resource Management

Risk Management

- Sustainability
- Asset Management
- Planning Modernization
- Climate Adaptation
- Engineering & Construction
- Planning
- Informed Budget
- Safety Programs
- Regional Sediment Management
- Infrastructure Strategy
- Operations
- Resilience
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.
The Cross-Cutting

Sustainability

Risk Management

- Asset Management
- Climate Adaptation
- Planning Modernization

Engineering & Construction

Planning

Operations

Programs

Safety Programs

Regional Sediment Management

Infrastructure Strategy

Resilience

Informed Budget

* All inform long term Sustainability as much as Sustainability helps to Integrate
A New Era of Integrated Water Resources Management

Mission Areas
- Navigation
- Flood Risk Management
- Ecosystem Restoration
- Emergency Management
- Regulatory
- Hydropower
- Recreation

Assets
- Aquatic ecosystems
- Infrastructure
- Human Capital
- Economic

Risk Drivers
- Climate change
- Sea level rise
- Aging infrastructure
- Water Scarcity
- Population Growth

Goals & Trade-offs
- Human Well-Being
- Ecosystem Integrity
- National Security

Heritage
- Aquatic ecosystems
- Infrastructure
- Human Capital
- Economic

Ways of Viewing Risk Drivers
- Sustainability
- Risk Management
- Resilience

Civil Work Transformation
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.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)

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 leved 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.

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.
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 (multipurpose) 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)
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.
CW Sustainability Initiative

**Sustainability Values for Action (SVAs)**

<table>
<thead>
<tr>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>We recognize that water resources are systems.</td>
</tr>
<tr>
<td>We partner and collaborate to maximize value to the Nation.</td>
</tr>
<tr>
<td>We take a life-cycle view.</td>
</tr>
<tr>
<td>We conserve resources for efficiency.</td>
</tr>
<tr>
<td>We seek opportunities to innovate &amp; improve.</td>
</tr>
</tbody>
</table>
Relationship between S & RSM

USACE Activities Building Toward Sustainability

New Levels of Adaptive Capacity
Reservoir Sustainability Plans

** Paul Boyd, John Shelley and Stanford Gibson

- DSAC
- Water Supply
- Sediment
- Environmental Impacts
- Flood Storage
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"
The word "sustainable" is unsustainable.

Frequency of use of the word "sustainable" in US English text, as a percentage of all words, by year.

Source: Google n-grams

Questions...
Backup slides
UNPACKING...

Why Sustainability?

Sustainability

Values
Human Well-Being
Ecosystem Integrity
National Security

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
Sustainable, Resilient

Unsustainable, Resilient

Unsustainable, Non-resilient

Sustainable, Non-Resilient

(DOES NOT EXIST)

---

System Performance

Time

Sustainability ~ slope of the line
Resilience ~ variance around the mean