

# High-level Expert Leaders Panel (HELP)

## Investments in Water Resources Infrastructure Reduce Risk and Save Money

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**U.S. Army Corps of Engineers**

**17 October 2014**

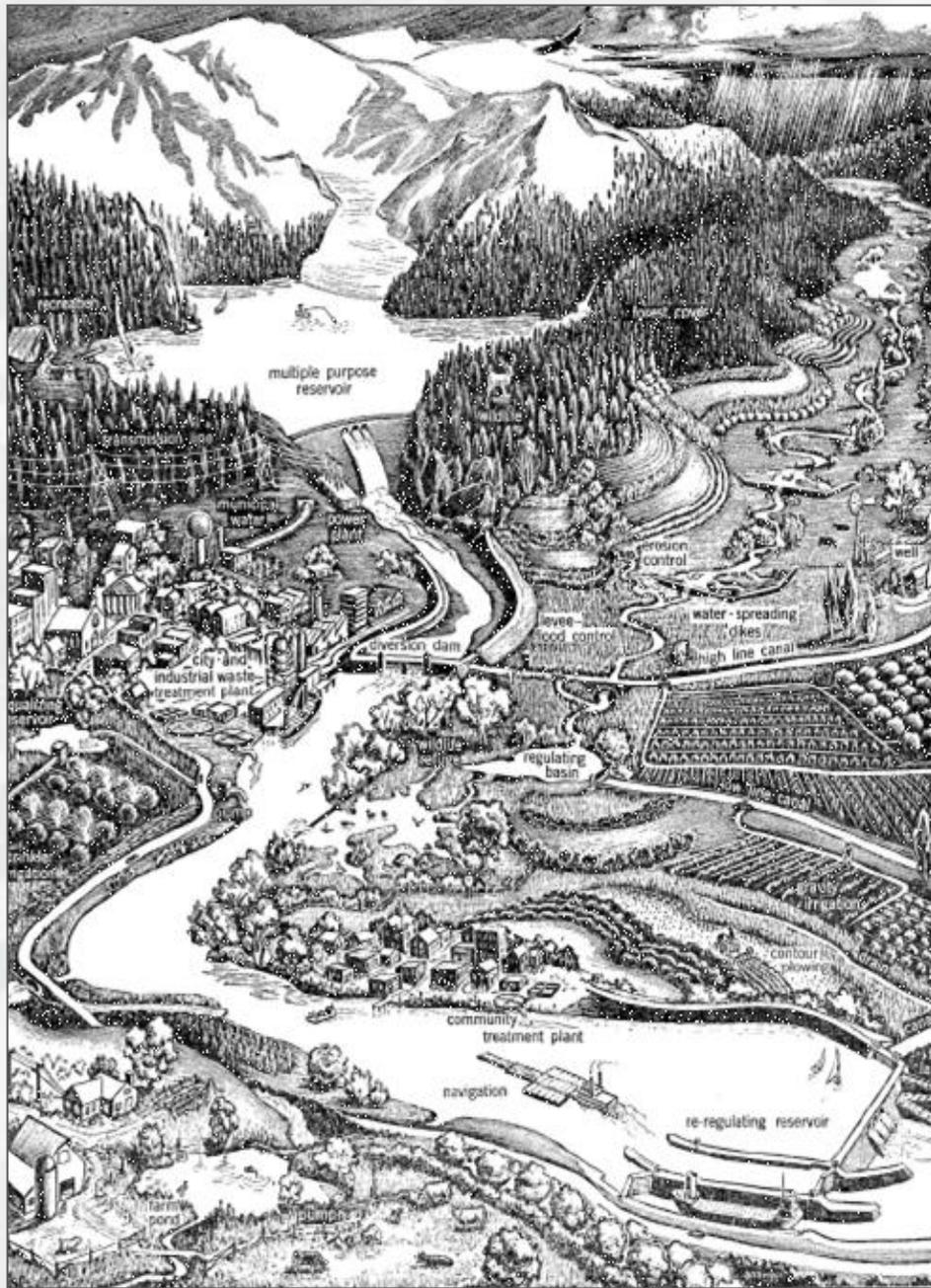


# *The Value of Past Investments*

An illustration of the relationship between services yielded by ecosystems, infrastructure, and the economic activities they support.

The value of natural and constructed systems was viewed as being greater than the sum of their intertwined parts, not only for the present generations, but also for those that would follow.

**From: “A Multiple-Purpose River Basin Development”, A Water Policy for the American People The Report for the President’s Water Resources Policy Commission (1950)**



# USACE CW's Economic Benefits & Revenues to the Treasury

Each dollar spent on the USACE Civil Works program generated ~ \$16 in economic benefits and \$5 in revenues to the U.S. Treasury.

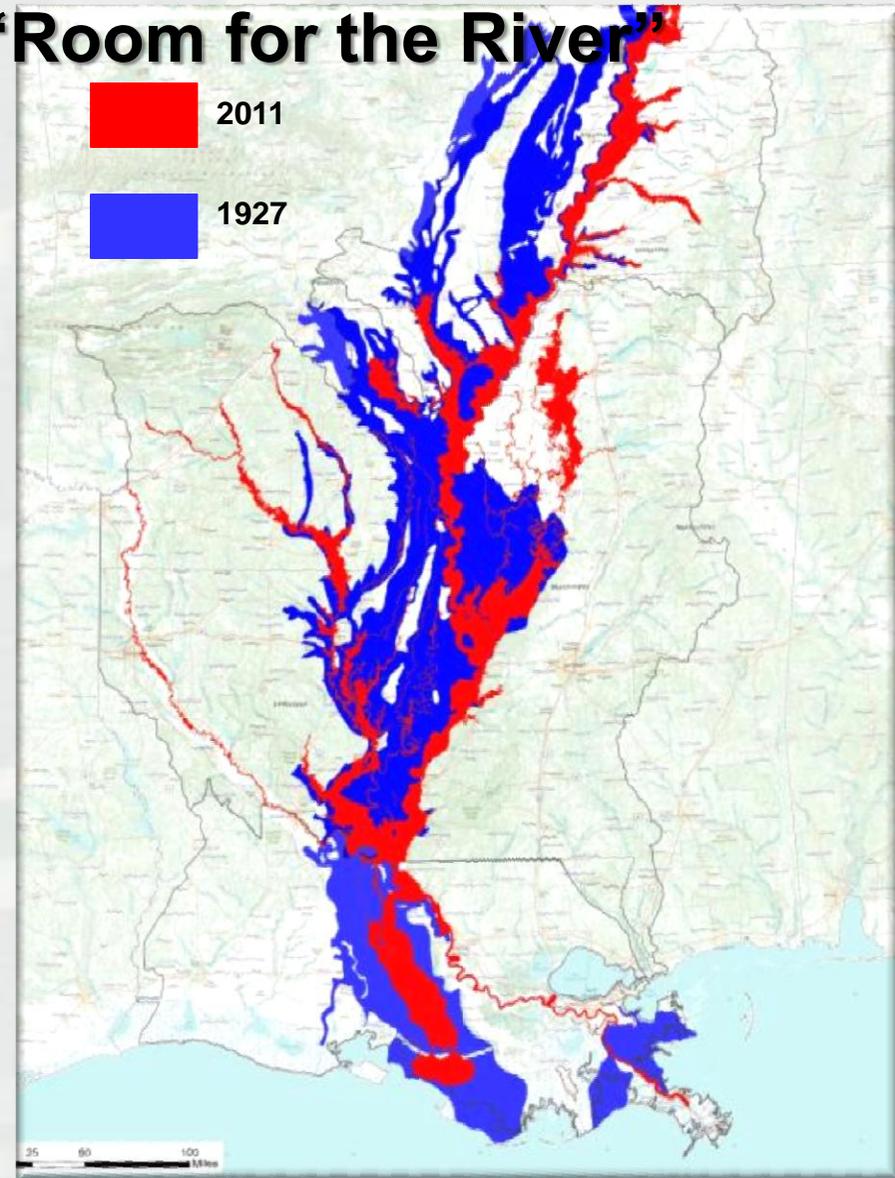
Program	NED Benefits (Billions of Dollars)	Net NED Benefits (Billions of Dollars)	U.S. Treasury Revenues (Billions of Dollars)
Flood Risk Management	\$59.47	\$58.84	\$18.90
Coastal Navigation	\$9.47	\$8.70	\$3.70
Inland Navigation	\$8.10	\$7.51	\$2.07
Water Supply	\$7.00	\$6.98	\$0.09
Hydropower	\$2.30	\$2.11	\$1.37
Recreation	\$3.20	\$2.91	\$1.13
Leases and Sales			\$0.03
<b>Total Annual NED</b>	<b>\$89.54</b>	<b>\$87.05</b>	<b>\$27.29</b>

Notes:

- (1) Net NED benefits are defined as NED benefits less the costs of operations, maintenance, and investigations. Since the costs associated with expenses and oversight by the Assistant Secretary of the Army (ASA) serve all Corps programs, including those we did not calculate benefits for in this report, this report does not account for those costs."
- (2) The Benefits and Revenues numbers are not additive.

# 1927 vs. 2011 Mississippi River Record Flood:

- **From “Levees Only” to “Room for the River”**  
(Challenge)
- 2011 Flood = 6.35 M acres  
(Response)
- **\$230 B damages prevented**
  - \$612 B since 1928
  - 44 to 1 ROI
- \$7 B in crop damages prevented
- 4.5 million people protected
- **\$3B Annual Transportation Rate Savings**



# What a Difference a Year Makes!

**2011**

**2012**



# The Cost of Failure to Invest... New Orleans Before and After

## Pre-Katrina "System" 2005

- 50% complete after 50 years
- \$130 B in Recovery Costs
  - 1500 Lives Lost

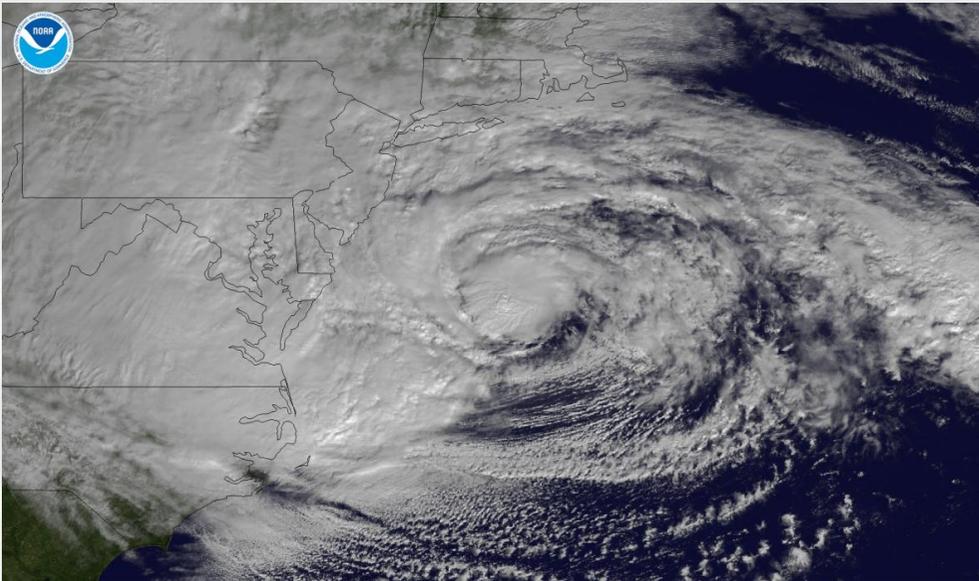
## \$14B Post-Katrina System

- Designed and Constructed in 6 years
- Successfully Performed during Hurricane Isaac

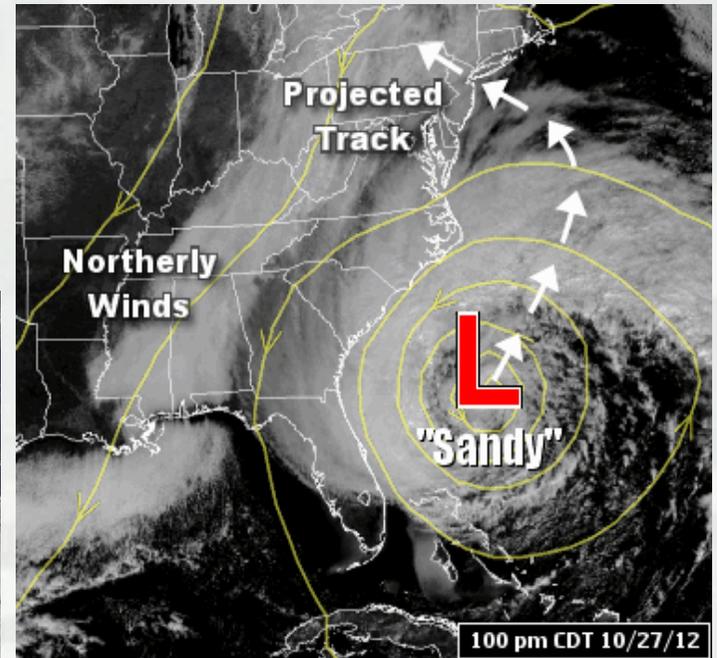


# Hurricane Sandy

Landfall Oct. 29, 2012



**NOAA GOES-13 satellite image taken October 29, 2012 showing the storm centered off Maryland and Virginia**



**Projected storm path**

# Sandy: Before and After



*Mantoloking, New Jersey. "Before" image captured by Google; "After" image captured by NOAA's National Geodetic Survey.*

# Urban Resilience: Integrated Approach

- Integrated approaches have a long history in U.S.
  - Flood of 1927 Jadwin Report
    - Required flood plains to carry flow, robust in floods of 2011
  - Sandy Infrastructure Systems Rebuilding Principles
    - Anticipate a changing environment
    - Integrate economic, social, and environmental resiliency and sustainability
    - Promote long term community protection

70th Congress } HOUSE OF REPRESENTATIVES } DOCUMENT  
1st Session } } No. 90

## FLOOD CONTROL IN THE MISSISSIPPI VALLEY

### MESSAGE

FROM THE

PRESIDENT OF THE UNITED STATES

TRANSMITTING

LETTER FROM THE HON. DWIGHT F. DAVIS, SECRETARY OF WAR, TRANSMITTING WITH FAVORABLE RECOMMENDATION THE REPORT OF MAJ. GEN. EDGAR JADWIN, CHIEF OF ENGINEERS, CONTAINING THE PLAN OF THE ARMY ENGINEERS FOR FLOOD CONTROL OF THE MISSISSIPPI RIVER IN ITS ALLUVIAL VALLEY

DECEMBER 4, 1927.—Referred to the Committee on Flood Control and ordered to be printed with illustrations

#### To the Congress of the United States:

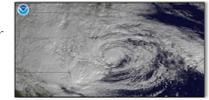
There is submitted herewith a letter from the Hon. Dwight F. Davis, Secretary of War, transmitting with favorable recommendation the report of Maj. Gen. Edgar Jadwin, Chief of Engineers, containing the plan of the Army Engineers for flood control of the Mississippi River in its alluvial valley.

In my message to the two Houses of Congress at the beginning of the first session of the Seventieth Congress, the flood-control problem of the lower Mississippi and the urgent necessity for its solution were outlined. The general duties and responsibilities of the Federal Government in connection therewith were therein discussed.

The total cost of the recommended project is \$296,400,000, distributed over a period of 10 years. This large sum is manifestly justified by the necessities of the situation and the benefits that will result. In determining the distribution of the costs, there must be considered not only the needs of the valley itself, who receive the major who s most States

#### INFRASTRUCTURE SYSTEMS REBUILDING PRINCIPLES

**Introduction.** In October 2012, the hybrid cyclone-nor'easter known as Hurricane Sandy roared toward the mid-Atlantic Coast. Even as the hurricane transitioned to a post-tropical cyclone, wind, waves, and storm surge wreaked havoc along the Atlantic Coast, especially to the coasts of New York, New Jersey, and Connecticut. The National Oceanic and Atmospheric Administration (NOAA) and the U.S. Army Corps of Engineers (USACE) are dedicated to working together to help rebuild more resilient and sustainable coastal communities that can adapt to and better mitigate the impacts of coastal hazards.



NOAA and USACE developed this document to promote a unified strategy for our activities in restoring the coast following "Superstorm" Sandy.

**Purpose.** Improve long-term performance of coastal rebuilding and restoration actions undertaken through the Infrastructure Systems Recovery Support Functions under the National Disaster Recovery Framework following Superstorm Sandy by implementing Executive Order 11988<sup>1</sup> and these consistent principles that:

- Anticipate a changing environment;
- Integrate economic, social, and environmental resiliency and sustainability; and
- Promote long term community protection, on a regional scale.

**Audience.** This document is intended for government at all levels – Federal, State, local and Tribal, non-governmental organizations, and the public to guide coastal restoration activities following Superstorm Sandy.

**Principles.** Recognizing that natural systems and processes are inextricably linked with and contribute to the resiliency of physical infrastructure, community well-being and coastal economies, we will:

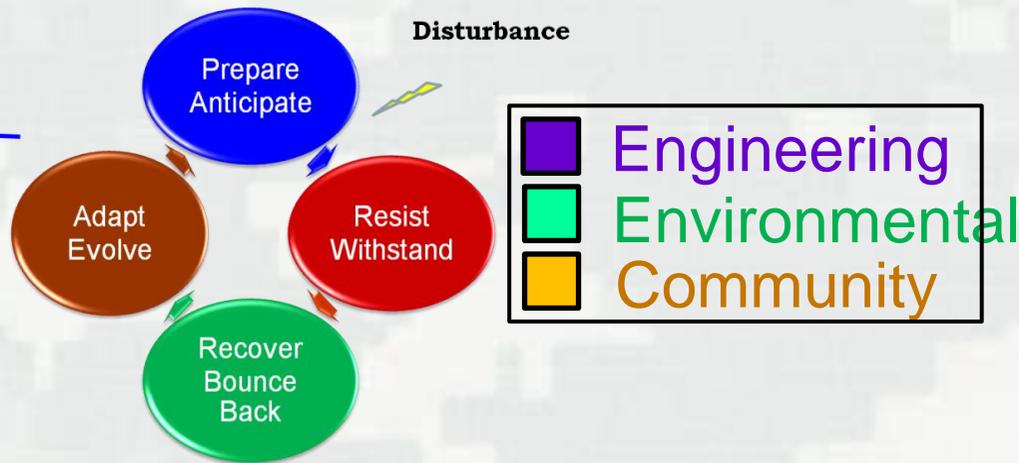
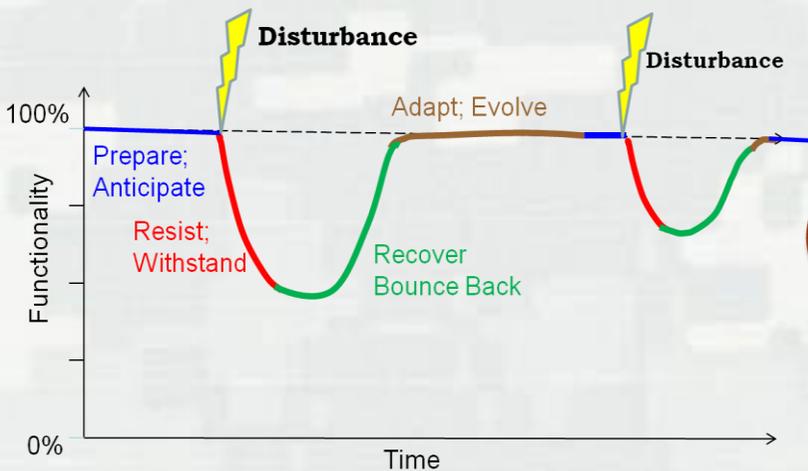
- 1 Work together in a collaborative manner across multiple scales of governance (i.e., local, State, Tribal, and Federal) and with relevant entities outside the government to develop long-term strategies that promote public safety, protect and restore natural resources and functions of the coast, and enhance coastal resilience.



# Concepts for Coastal Resilience

**Resilience:** the ability of a *system* to **Prepare for**, **Resist**, **Recover**, and **Adapt** to achieve functional performance under the stress of disturbances through time.

Study	Definition
NAS (2012)	"Resilience is the ability to <b>prepare and plan for</b> , <b>absorb</b> , <b>recover from</b> , and more successfully <b>adapt</b> to adverse events."
E.O. 13653 (2013)	"resilience means the ability to <b>anticipate</b> , <b>prepare for</b> , and <b>adapt</b> to changing conditions and <b>withstand</b> , respond to, and <b>recover</b> rapidly from disruptions."



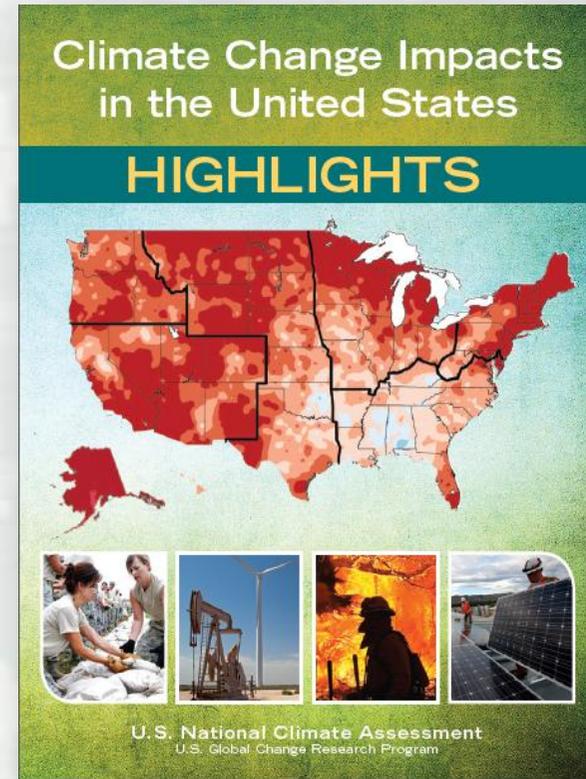
# The Questions to Ask?

- How do we cope with new understandings of climate variability and risks of water-related disasters?
- How do we integrate hard infrastructure with soft behavioral approaches?
- How do we manage ecosystems while still allowing socio-economic growth?
- How are broad ranges of stakeholders brought into the process?
- How do we build new capacity to achieve water security?
- How do we prepare and invest in the future?



# Key Messages for Urban Systems, Infrastructure, and Vulnerability

- National economy, security, and culture all depend on the resilience of urban infrastructure systems
  - Essential infrastructure systems will increasingly be compromised
  - Disruptions of services in one infrastructure system will almost always result in disruptions in one or more other systems
- Urban climate vulnerability and adaptive capacity are influenced by pronounced social inequalities
- Preparedness and resilience requires cooperative private sector and governmental activities



# Summary

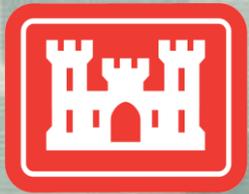
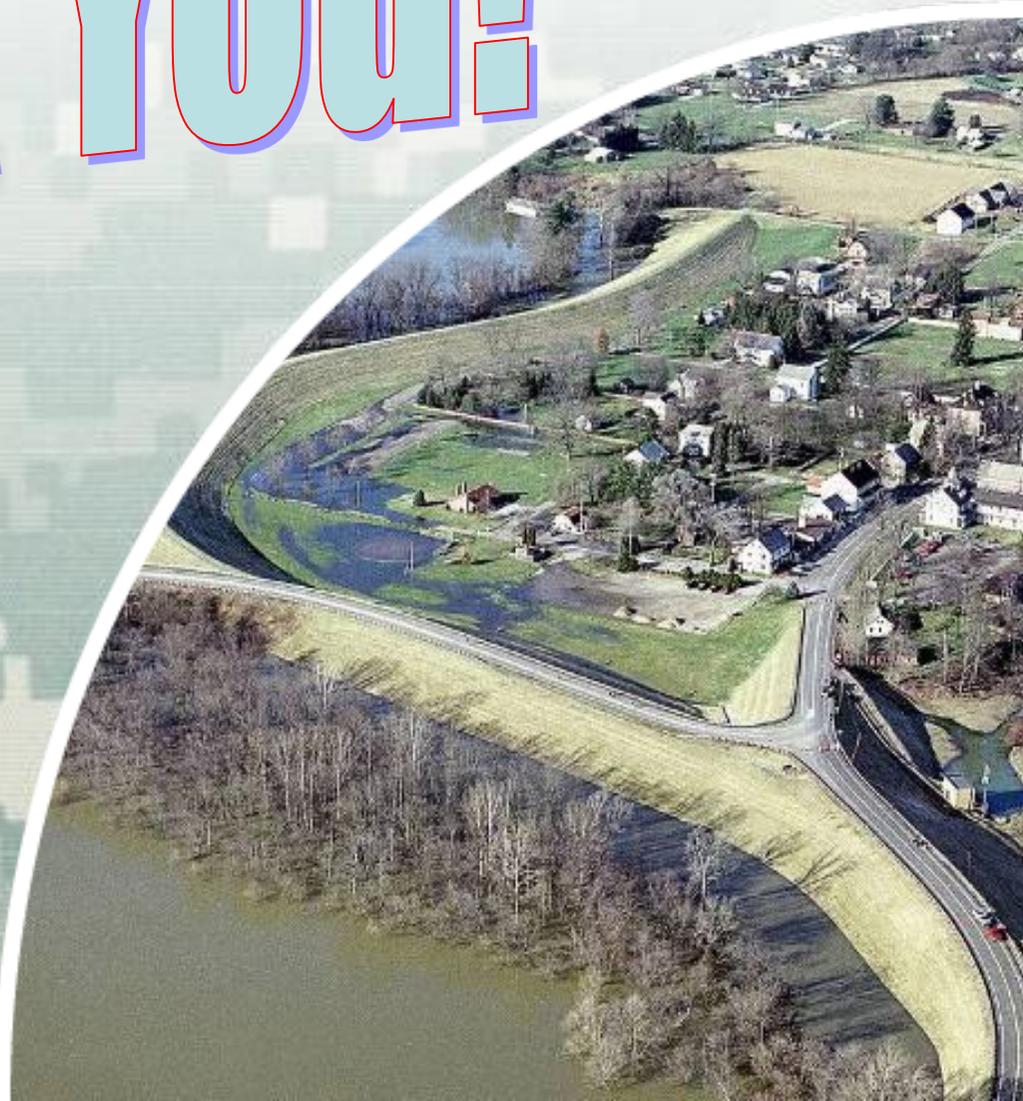
- The resilience of urban infrastructure systems will increasingly be compromised by climate in addition to other agents of change

## ***BUT***

- Reimagining urban resilience is possible when diverse groups come together to create new ideas and new combinations of ideas, as is being done in many forums, including this one



# Thank You!



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**BUILDING STRONG**®

# Infrastructure Systems

## Rebuilding Principles

- Work together to develop long-term strategies
- Improve coastal resilience
- Increase awareness of risks and consequences

