High-level Expert Leaders Panel (HELP)

Investments in Water Resources Infrastructure Reduce Risk and Save Money

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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.

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

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

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"

- 1927 Flood = 16.8 M acres (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
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
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.

<table>
<thead>
<tr>
<th>Study</th>
<th>Definition</th>
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<tbody>
<tr>
<td>NAS (2012)</td>
<td>“Resilience is the ability to prepare and plan for, absorb, recover from, and more successfully adapt to adverse events.”</td>
</tr>
<tr>
<td>E.O. 13653 (2013)</td>
<td>&quot;resilience means the ability to anticipate, prepare for, and adapt to changing conditions and withstand, respond to, and recover rapidly from disruptions.”</td>
</tr>
</tbody>
</table>
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!
Infrastructure Systems
Rebuilding Principles

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