North Atlantic LCC Briefing

Recommendations for assessing improvements in coastal resilience from projects within the DOI Hurricane Sandy Mitigation and Resiliency Program

The DOI Metrics Expert Group

December 9, 2014

North Atlantic LCC Briefing

Federal-Wide Goal:

"Quantifying benefits of resilience projects and calculating resilience project return on investment in order to better inform future public spending"

Federal Disaster Recovery Coordination Workplan, 2013

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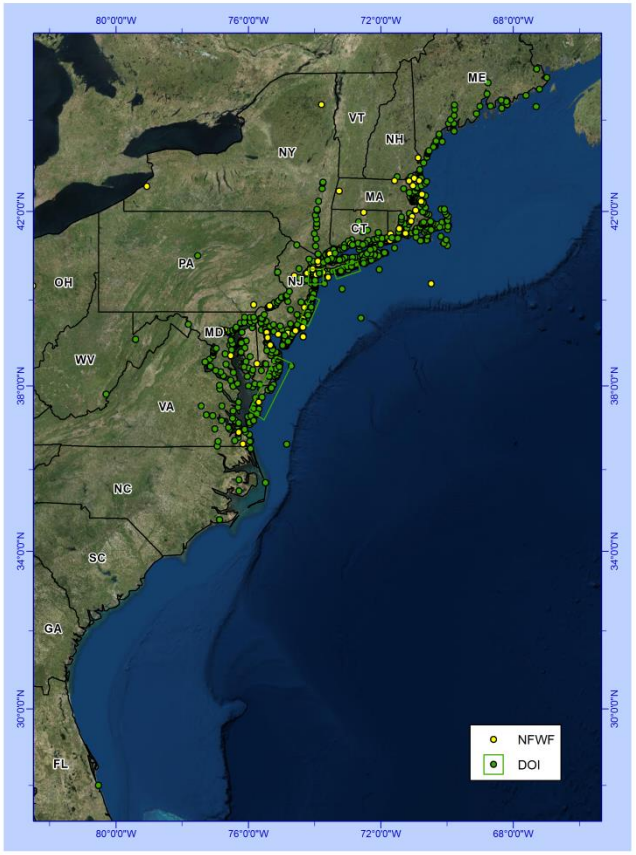
- Short-hand of the DMEG Goals:



- Define the scope and strategy for a DOI resilience assessment
- Select core metrics for subsets of projects (140 projects reviewed)
- Determine data and information gaps (Baseline data, Gaps in understanding; gaps in methodology)
- Recommended post-assessment measurements
- Phase 2: Identify metrics for individual projects, and recommend immediate actions to fill gaps.

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- Some bounding conditions for the DMEG process:
  - Need to fill baseline data and study gaps: immediate action was needed on projects underway
  - Metrics and measurements recommendations must be seamless with other resilience assessment efforts if possible (NOAA and USACE participating)
  - Need to use current or historical measurements where possible for early trends detection
  - Need metrics that allow comparison among projects addressing similar coastal features
  - Strive for an integrated, systems-level assessment

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- First products completed :
  - A spreadsheet of first-draft recommended metrics for measuring resilience in specific coastal features
  - Grouping of the DOI projects into common categories for assigning metrics and comparing results
  - A recommended assessment strategy for DOI projects
  - A recommended strategy for filling gaps in data and understanding required for the assessment
  - A recommended strategy for earliest detection of resilience improvement from project activity, and for tracking changes in coastal resilience over time

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- Some Important Conclusions:
  - Metrics can be developed to detect resilience change for projects grouped by key coastal features.
  - A baseline of data is essential, integrating new and existing data to enable detection of trends
  - Socio-economic metrics of coastal resilience are still in early development and need refinement.
  - A common, collaborative data-management and sharing strategy with clear protocols is missing, and is critical
  - Detection of changes in resilience by 2016 is highly unlikely- alternative strategies are necessary.

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- Next steps:
  - Refine the report, map tool, and metrics for sharing with other resilience efforts (i.e. peer review/revision)
  - Re-convene the DMEG with additional partners to expand collaboration on resilience metrics
  - Define standard protocols for measuring core metrics, and begin filling data/ knowledge gaps this year
  - Outline an analysis strategy for the assessment process
  - Conduct an RFP through NFWF for an assessment team

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- Coastal Metrics Features:
  - Beach/Barrier Island
  - Green Infrastructure: Oyster reefs, living shorelines
  - Other Green Infrastructure (hydrology management, erosion control)
  - Nearshore deep and shallow
  - River/riparian
  - Marshes/wetlands
  - Uplands/watersheds
  - Estuaries/ponds
  - Urban environment; Grey infrastructure; Other grey activities (e.g. dredging)

Example from the recommended metrics tables: Environmental Metrics

Coastal Resilience Feature	Project Objectives	Recommended Core Metrics (objectives metrics may measure in parentheses)	Potential benefits (in addition to project objectives)
Beach/Barrier Island	1. Restore/improve beach habitat to benefit wildlife and plants 2. Dune creation to create/protect wildlife habitat 3. Improve ecosystem and community resilience to storm surge events	Biotic wildlife population responses (1, 2) Abiotic surge or wave force levels (3) current dynamics (3) pre and post storm rates of erosion (1, 2, 3) pre and post storm wave height (2, 3) storm water innundation level (2, 3) change in near shore sediment character and movement (1, 3) Structural/Engineering Beach and dune accretion/erosion transects (1, 2, 3) Repeated beach profiles (submerged to dune) (1, 2, 3) Historical context of these and other measurements	Methods Development: Improves methods of measuring beach/berm resilience. Builds dynamic resilience measures for natural systems Physical Model Validation: Improves understanding of coastal processes that control resilience Ecosystem Model Validation: Improves model of ecosystem function and prediction of ecosystem resilience and vulnerability, and habitat sustainability Ecosystem Resilience Index and the Community Resilience Index: Inform development of these indices as specified in the President's Priority Agenda "Enhancing the Climate Resilience of America's Natural Resources.
Green Infrastructure: Living shorelines/ Oyster breakwaters	1) stabilize and potentially enhance shoreline integrity 2) improve water quality 3) protect/improve habitat to benefit fish, wildlife, and people 4) protect infrastructure (e.g., roads, dikes, buildings)	Biotic oyster biomass extent (1, 2, 3, 4) oyster population (recruitment) (1, 2, 3, 4) oyster coverage (1, 2, 3, 4) organism health (diseases, growth rates, survivability of oysters or other organisms) (2, 3) vegetation cover (1, 3, 4) Abiotic vertical accretion (1, 3) storm surge (1, 3, 4) wave measurements (1, 3, 4) Water Quality: (2, 3) water temperature water salinity pH dissolved oxygen turbidity nutrients contaminants Structural/Engineering structures's resilience to waves (movement, % intact) (1, 3, 4) shear strength of oyster beds, grass beds, etc. (1, 3, 4)	Methods Development: Develops methods to detect changes in oyster bed or seagrass stability Physical Model Validation: Metrics decrease uncertainty in models of controlling processes in living shorelines, e.g. surge suppression and shoreline erosion Ecosystem Model Validation: Improves model of oyster bed function (habitat creation) Ecosystem Resilience Index and the Community Resilience Index: Inform development of these indices as specified in the President's Priority Agenda "Enhancing the Climate Resilience of America's Natural Resources.

Example from the recommended metrics tables: Socio-Economic Metrics

Ecosystem Service	Project Objectives	Recommended Core Metrics (objectives metrics may measure in parentheses)	Potential benefits (in addition to project objectives)
Ecosystem services (all)	Cost-benefit Analysis. Metrics should consider status and trends, stressors, and policy effectiveness	Adaptive management strategies completed and implemented, including provisioning, reconstruction, cultural, commerce, and management priorities, and adjustment scenarios for re-establishing or enhancing resilience	Measurements established to cover all communities and situations. Where we set up measurements could affect how fast we can respond for social dimension(eg evacuating hospitals)
Planning Services for Adjustment scenarios (Prepare)	Effective planning processes established to sustain/improve community and commerce sustainability		Community connectivity and communication should be partnership with other agencies, and linked to our ecosystem science work. Not just in eco services but in response/preparedness
Educational/ Inclusion Services (Prepare)	Public awareness and youth training are sufiicient to enable decision and presponse proceses to function properly	Outreach and public education implemented - # of organizations, projects impacted	Aware and supportive public; Fewer accidents and emergency responses
Health/ Safety Services (Absorb)	Easy and effective implementation of health and emergency warning system		Post-storm health care contingencies are established for rapid deployment; Long-term shifts in health and emergency warning requirements for storm surge and SLR are defined and sustainability plans implemented

Example from the recommended metrics tables: Data Management Metrics

Ecosystem Service	Project Objectives	Recommended Core Metrics (objectives metrics may measure in parentheses)	Potential benefits (in addition to project objectives)
Data Standards & Management	Establishes a common set of Federal and DOI Data Management Standards are adopted by all DOI projects	Establishes Project Data Management Plans (cover full lifecycle from data acquistion through publication and sharing of data products)	Standarizes collection and storage of location data and documentation of Methods and Protocols
Enterprise Data Systems	Develops standard Data Models (data structure) for storage and quality management of common types of data	Establishes approved Thesauri for keyword terms and descriptive / categorical classifications; Establishes Metadata standard for the Project and all Data Inputs and Products (used for data catalog, archive, discoverability)	Establishes authoritative data sources for common data themes (external data to be used preferentially by projects)
Integrated Local Systems	Captures local system knowledge, and constructs systems for seamless data sharing	Aligns Inconsistent measurements (GAP)	Completes data translation into useable forms (GAP)
Web and other communication systems	Makes decision support models accessible and easiliy applied: improve the timeleness and effectiveness of decisions	Communicates successes and lessons-learned in peer reviewed publications, data publications	Includes project metadata in various searchable data catalogs (make data discoverable)
Field Data Recovery	Archive for field records and physical samples established if secure database is unavailable		
Archive systems	Establishes an SOP for preparing data and models for archive	Utilizes an approved data repository that has data-retrieval functions	Migrates data into an appropriate established database (GAP)

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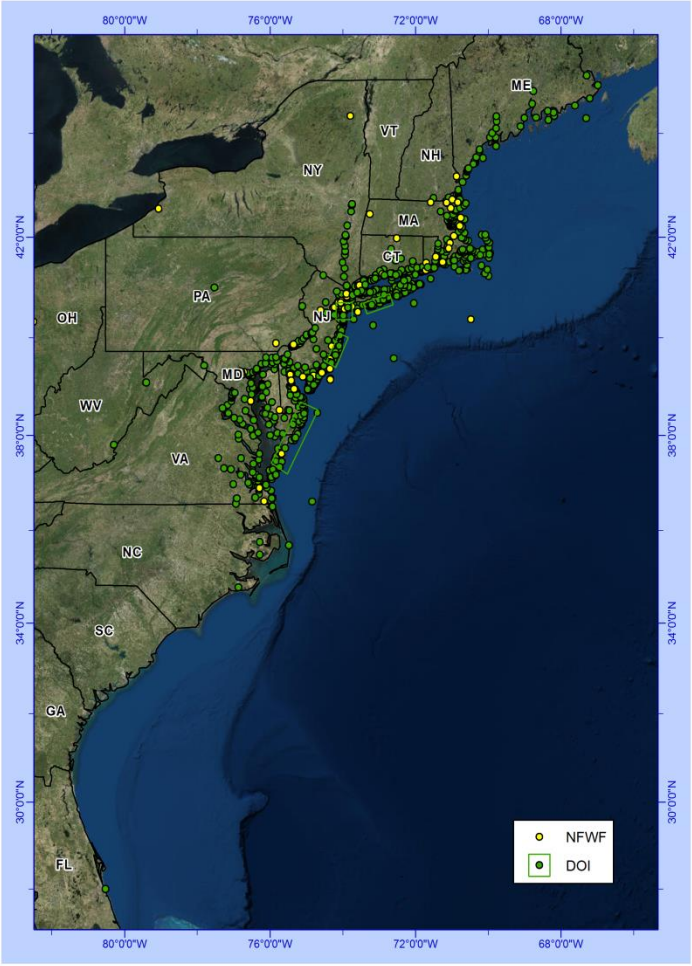
- Primary Recommendation:



Center-point of DOI-funded Sandy Projects, 2013-15

- Establish multi-scale, pre- and post-project monitoring. Without it we won't be able to detect or assess changes in coastal resilience resulting from the DOI projects and programs.
- Use efficient monitoring strategies, using alternative accelerated-assessment methods described in the report, to limit detection time and expense.

DOI Metrics Expert Group

DMEG Initiating Team

- Peter Murdoch- USGS (Chair)
- Rick Bennett- FWS (Co-Chair)
- Mary Foley- NPS
- Lia McLaughlin- FWS
- Rachel Muir- USGS
- Mike Rasser- BOEM
- Charles Roman- NPS
- Jeff Waldner- BOEM
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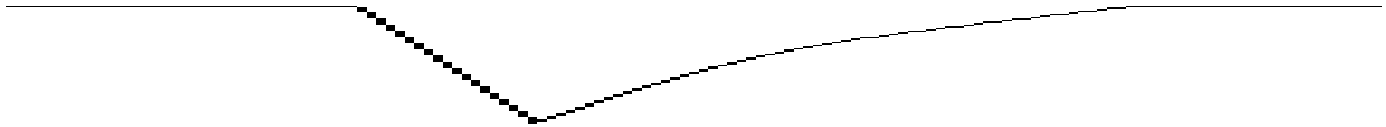
DOI Metrics Expert Group

- What is the DOI Metrics Expert Group?
  - Team of scientists and socio-economists charged by DOI to scope an assessment of changes in coastal resilience resulting from DOI-sponsored projects.
  - Individually, they are experts on the measurement of resilience and vulnerability in the coastal zone for specific land/water features and ecosystem services

ACE: Matrix Framework



	Prepare	Absorb	Recover	Adapt
Physical	Restore a wetland; remove a dam	Design to withstand 1000 yr flood	Time Series of Fish Population	Anticipate climate change needs
Information	Understand change thresholds	GPS Measurement of Coastline		
Cognitive	Project Prioritization Method	Dam Operation Plan		
Social	Participation in Community Education/Outreach Program			