How to Prioritize and Evaluate Trade-offs Between Nature-Based Solutions Co-Benefits

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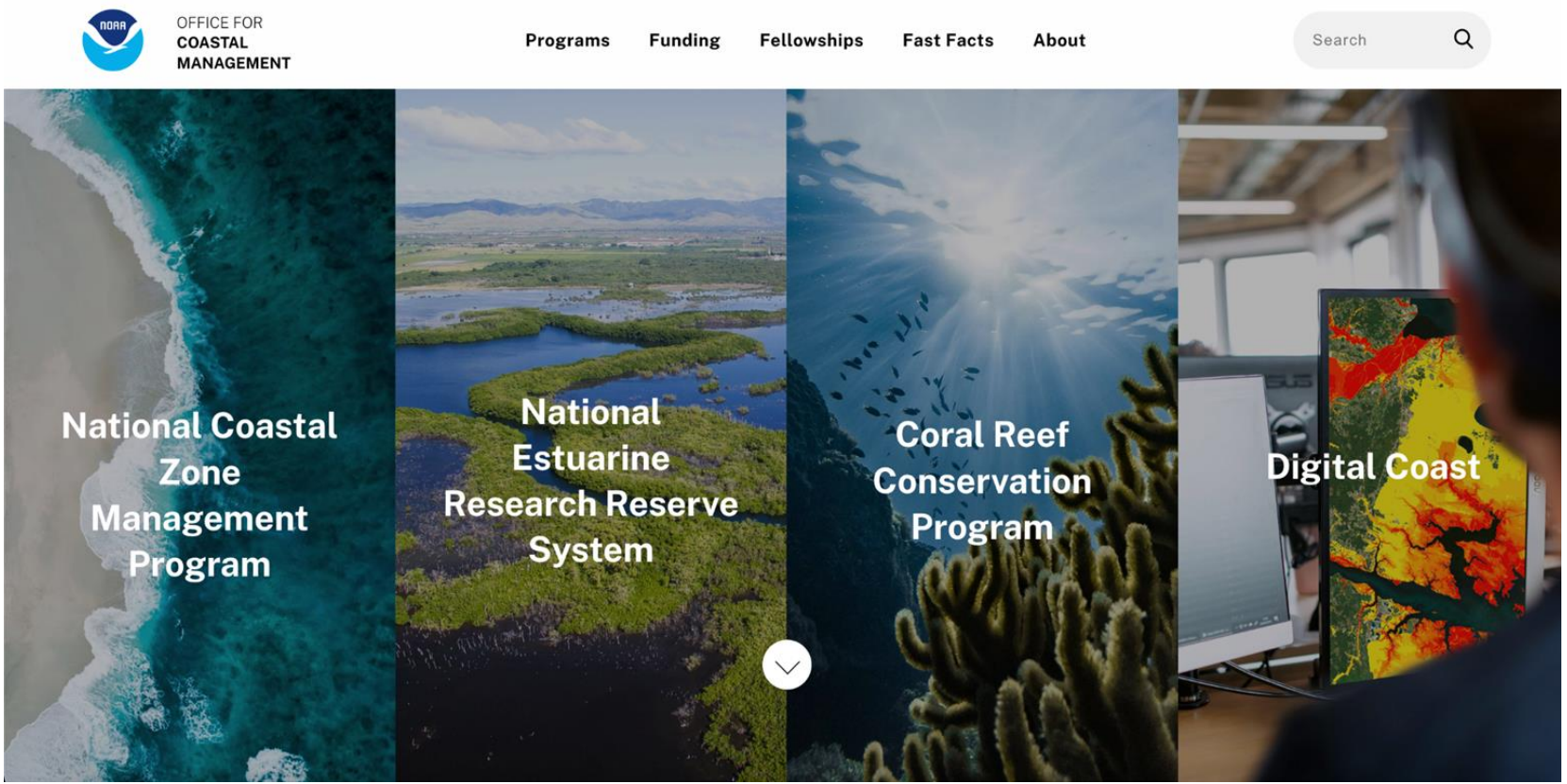
on contract to NOAA Office for Coastal Management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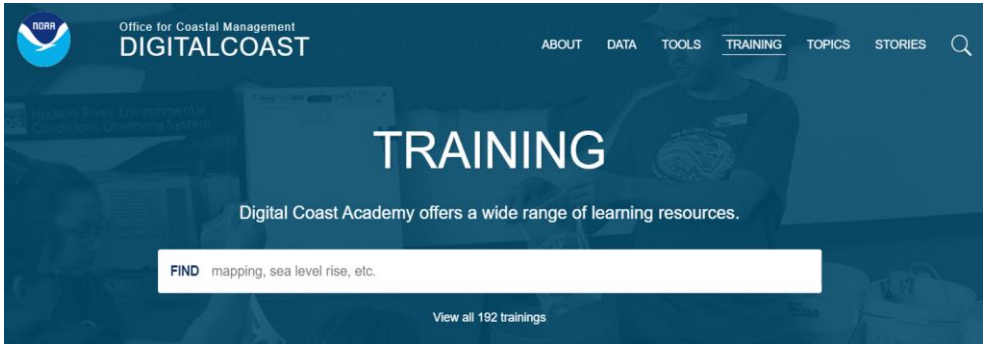

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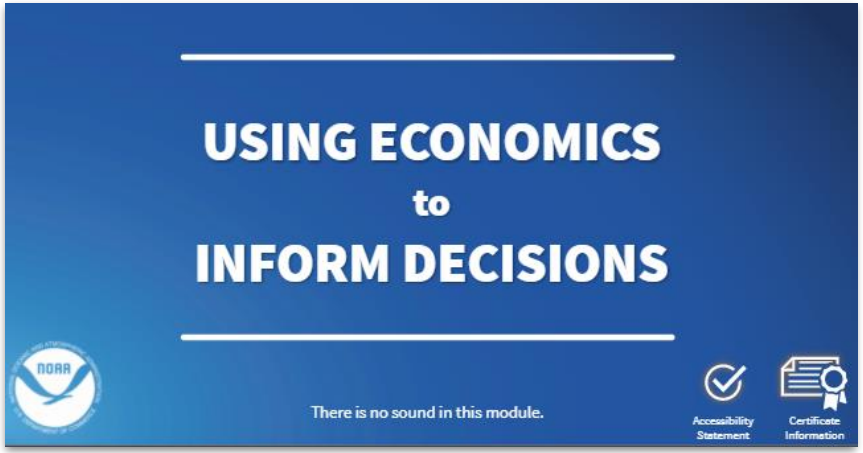
Self-Guided Economics Guidance Module

Help to get your economic analysis started

1. Self-assessment
2. Consider economic objective for your project
3. Dive into approaches
   a. What is it?
   b. Data needed
   c. Steps – guidance documents



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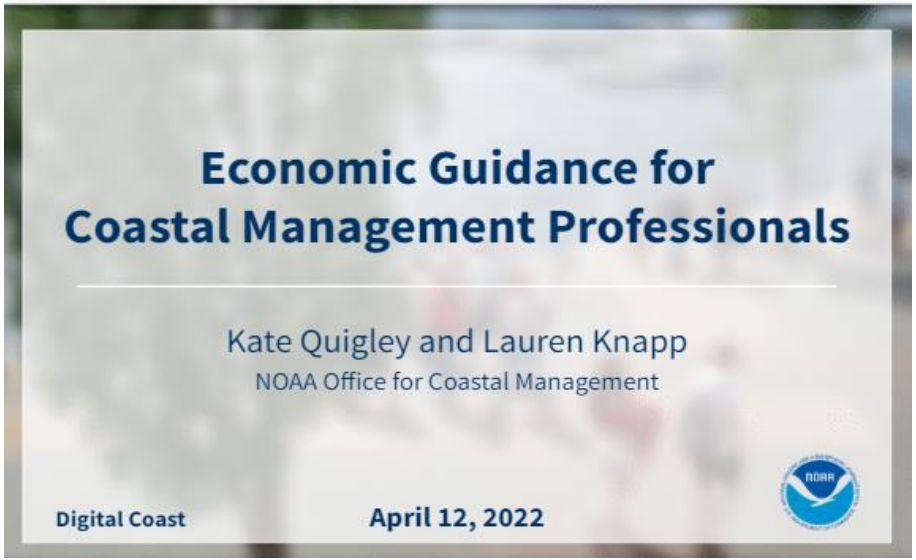
Economics Guidance for Coastal Management Professionals

- Understand basic terminology
- Identify approach based on objectives, level of expertise, and funding
- Locate support tools and data
- Conceptualize appropriate questions to ask an economist or an expert



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Ecosystem Goods and Services Values

Difficult to estimate for several reasons

- Project-specific studies are expensive, time consuming
- Benefit transfer may or may not be accepted
- Lack of expertise: possible double counting, or not even knowing which values they can capture
- If benefit transfer is accepted, need to have a completed, peer-reviewed study that is defensible, know where to find it, and how to tweak the numbers for your area of interest

Ecosystem Goods and Services Values

The problem: Failure to estimate benefits and/or severely discounting the value of future benefits →

- Lower “benefit-cost ratio”
- Grey solutions have inherent advantage in benefit-cost analysis framework
- Fewer nature-based solutions projects

Management Context

→ Decisions need to be made

→ **Questions arise**

→ Grant applications require economic analyses

→ Economic analyses help provide answers

*Which project idea **has the highest return on investment**?*

*How do I advocate for **nature-based solutions**?*

***How many** jobs will the project generate?*

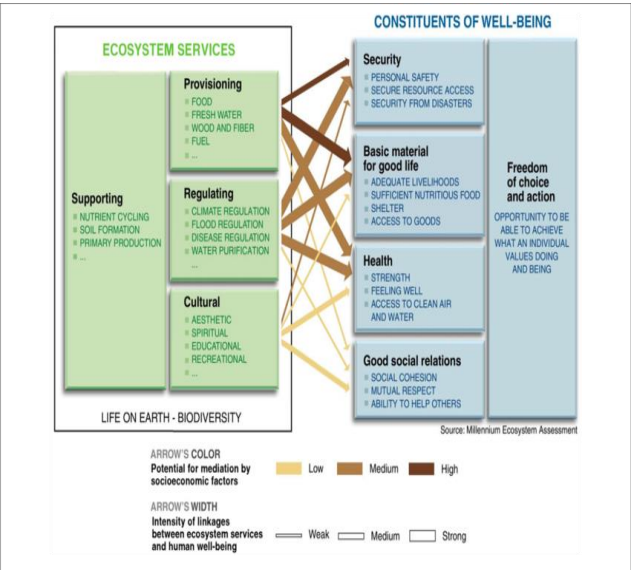
*How do I incorporate **equity** considerations?*

What You're Looking for (Economics-Wise) Matters!

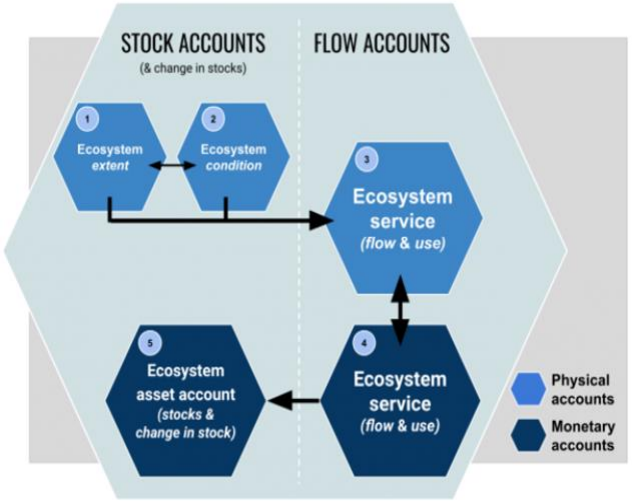
Example: Wetlands

- What is the impact of new spending from restoring wetlands? → **Economic impact/input-output analysis**
- What is the lowest cost wetlands restoration project to decrease flood inundation? → **Cost-effectiveness analysis**
- Would people be willing to pay more taxes to restore wetlands? → **Choice experiment/willingness to pay (survey)**
- Do wetlands provide benefits by preventing wave runup during storms? → **Ecosystem goods and services valuation: avoided damages**
- Wetlands sequester carbon; what is this worth to society? → **Blue carbon/social cost of carbon**

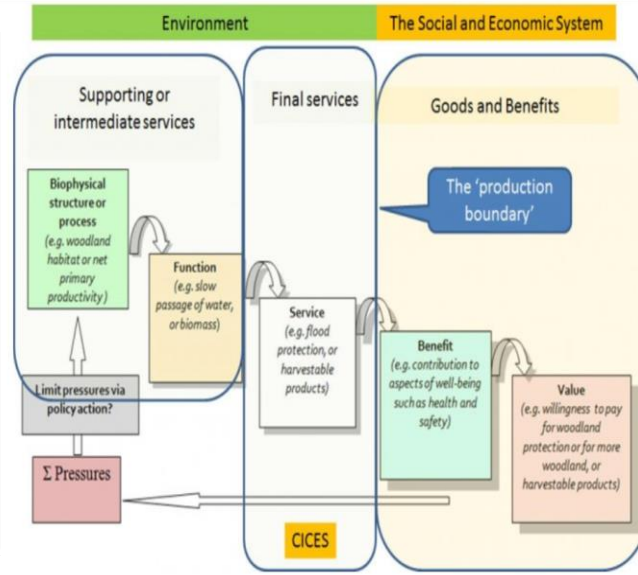
Different frameworks to get to decision-making, aka benefit-cost analysis!



UN's MEA



UN's SEEA



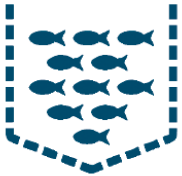
CICES 5.1

Tell a story about benefits	Show benefits of specific project	Compare projects with similar goals	Calculate if benefits exceed costs	Estimate how project spending flows through economy	Show value of the coastal and or marine economy
					
Case Studies Focus Groups Interviews Literature Review Surveys	Case Studies Benefits Valuation Benefit-Cost Analysis Input-Output Analysis	Cost-Effectiveness Analysis Benefit-Cost Analysis Input-Output Analysis	Benefit-Cost Analysis	Input-Output Analysis	Regional Economic Accounting Input-Output Analysis
EXAMPLE Inform people about the benefits of natural infrastructure to decrease flooding	**EXAMPLE** Show benefits of making improvements to a beach and adjacent wetland	**EXAMPLE** Select the least expensive strategy for decreasing erosion in a coastal community	**EXAMPLE** Calculate the return on investment of using living shorelines to decrease storm surge during hurricanes	**EXAMPLE** Estimate how port redevelopment will impact jobs and gross domestic product in the coastal economies located nearby	**EXAMPLE** Estimate employment and gross domestic product in the recreation and tourism sector
					

 Resources anticipated to be expended, such as time, expertise, and funding

What Benefits Can Be Valued?

- Mitigation of coastal storm damages during storm events
- Avoided replacement of essential services (water filtration)
- New information exchanged at trainings
- Volunteer hours
- Increased species' populations
- New or increased ecosystem services
- Lives saved or decreased mortality/morbidity
- Time saved

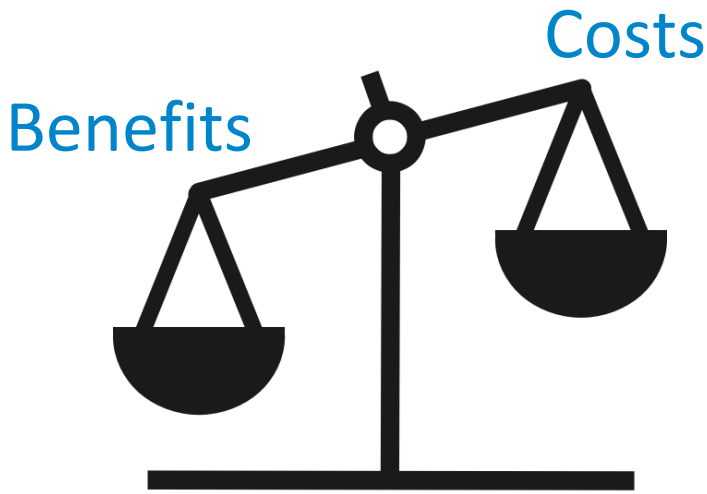
Aquaculture, increase in fish populations	Coastal flood protection, hazard mitigation	Regulation of water flow and quality	Recreation, experiences	Science, training, education
				
Benefit Transfer	Benefit Transfer	Benefit Transfer	Benefit Transfer	Benefit Transfer
Market Price	Damages Avoided	Replacement Cost	Willingness to Pay	Travel Cost
	Replacement Cost		Travel Cost	Opportunity Cost
	Hedonic Valuation		Opportunity Cost	
			Market Price	
			Hedonic Valuation	
EXAMPLE Wetland restoration provides nursery habitat, helping to increase commercial fish populations	**EXAMPLE** Coastal nature infrastructure projects result in avoided structural damages during disasters	**EXAMPLE** Wetland restoration results in increased water filtration, alleviating some need to provide that through man-made systems	**EXAMPLE** Coastal beaches provide various recreation opportunities of value to society	**EXAMPLE** People expend time and resources of value to attend educational coastal management seminars; in turn, these seminars also can be tied to improved management decisions and healthier wetlands

Federal Benefit-Cost Analysis Requirements and Uses

→ Federal Emergency Management Administration (FEMA)
→ Housing and Urban Development (HUD)
→ Department of Transportation (DOT)

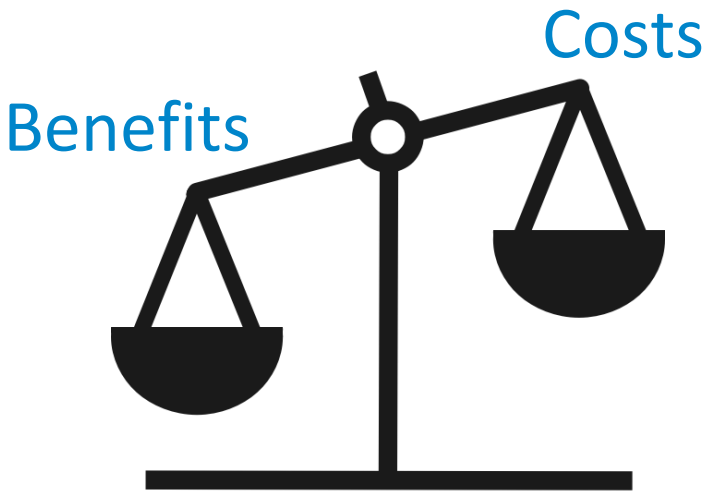
Other benefit-cost applications

- Regulations and Economic Impact Statements (USACE)
- Ex-post evaluation (NFWF coastal resilience grants)



Benefit-Cost Analysis Training (Forthcoming)

- How do I estimate ecosystem goods and services benefits and incorporate into a benefit-cost analysis?
- What if I don't have ecosystem service benefits data for my area?
- How do I incorporate equity considerations?
- How do I consider future climate conditions?



Ecosystem Goods and Services Values:
Data Sources

- Bluevalue.org
  - *International, searchable database (by ecosystem type, method)*
- NOAA Green Infrastructure Effectiveness Database
  - Case studies, United States
- Environment Canada
  - *Environmental Valuation Reference Inventory*
- U.S. Federal Emergency Management Agency
  - *Pre-calculated benefits*

Ecosystem Goods and Services Values: Data Sources Continued

- Biodivcanada
  - *Ecosystem Services Toolkit*
- NOAA/Texas A&M University Sea Grant
  - *Wetland Economic Benefits for Landowners*
- Oregon State University
  - *Recreation Use Value Database*

Equity + BCA is increasingly important.

- When distributional effects are not examined
  - Allows for examination of cumulative impacts and validation of "no harm"
- When an inappropriately high discount rate is used
  - Has implications for intergenerational equity
- Cultural services – large focus in our project(s)

Ecosystem Goods and Services Values

Technical assistance and trainings help, but potentially not enough to overcome gap in knowledge about what will be accepted.

Looking forward:

- Create or leverage pre-calculated ecosystem services values; similar to FEMA's BRIC approach
- Find off-the-shelf tools: NIST's EDGe$ tool
- Review existing meta analyses to update the above
- Commission original studies to estimate site-specific values

Our Valuation Studies: Examples

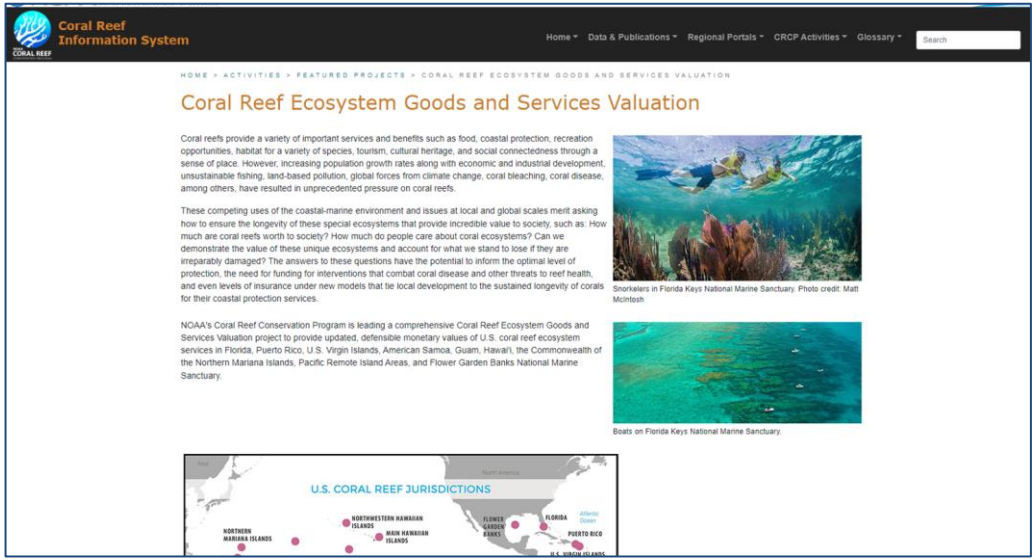
- Value of Information: Digital Coast
- Regional Economic Accounting
  - Economics National Ocean Watch
  - BEA Marine Economy Satellite Account (MESA)
  - ENOW in the U.S. territories (underway)
- Valuation of NOAA Office for Coastal Management Coastal Zone Management Programs (wetlands purchased/restored, trainings provided to partners, benefits of collaboration, beach access)
- Comprehensive valuation of EGS that coral reefs provide to society

Coral Reef Ecosystem Goods and Services Valuation

- 2021: Scoping
- 2022: FL and Guam
- 2023 - 2024

Methods

- Mostly benefit transfer
- Contingent valuation?



https://www.coris.noaa.gov/activities/coral_esv_project/welcome.html

Project Research Consultation

Economics guidance help with different coastal projects

- Brainstorming project ideas and methods
- Useful questions to ask if hiring economic consultant
- Some common pitfalls and tips to consider
- Finding and using data

Free—call or email us: ***econguidance@noaa.gov***

Questions?

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