QUANTIFYING COASTAL Ecosystem SERVICES

Session 3: State of the Knowledge on Incentives of the Blue Carbon Approach

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SESSION 3: QUESTIONS

• What information is needed to assess the commercial viability of blue carbon crediting for wetland restoration and mitigation?

• What do we know about the co-benefits of the blue carbon approach and their economic value (e.g., ecosystem services)?

• What are common knowledge needs/strategies for adopting nature-based solutions that could enhance blue carbon CDR?
HUGE DEMAND

- Countries
- Companies
- Development banks
- Local government
- NGOs

Ruckelshaus et al. 2015 Ecological Economics
PRODUCTION FUNCTIONS

Alternative management, policy

Δ Ecosystem structure

Δ Ecosystem function

Δ Ecosystem service

Δ Ecosystem service value

Habitat restoration decision

Size of coastal habitat buffer

Hydrodynamic conditions

Avoided erosion and flooding of public or private land

Avoided damage costs
People affected

Change in environment → change in benefits (production function)

Arkema et al. 2017 Year in Ecol & Cons Bio
COASTAL ECOSYSTEM SERVICES

“Co-benefits” of blue carbon approaches

Carbon Storage & Seq.

Fisheries

Coastal protection

Recreation & Tourism

Barbier et al. 2011 Ecol Mono
LESSONS LEARNED / RESEARCH NEEDS

- Innovate by connecting science and practice
- A wide variety of metrics resonate
- Incorporating people gives a different result
- Develop models that can assess alternative futures
- Accounting for spatial variation is critical

Ruckelshaus et al. 2015 Ecological Economics
INNOVATE THROUGH SCIENCE & PRACTICE

Belize Integrated Coastal Zone Management Plan

GOVERNMENT OF BELIZE

InVEST
integrated valuation of ecosystem services and tradeoffs

SCIENCE

STAKEHOLDERS

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• **Preferred plan** will lead to greater returns from coastal protection and tourism than either conservation or development oriented plan.

• **Preferred plan** will lead to greater returns from fisheries and extent of functional habitat than current management.

• **Preferred plan** improves expected coastal protection by 25% over a previous version of the plan based on stakeholder visions alone, and more than doubles revenue from lobster fishing.

Arkema et al. 2015 PNAS
Coastal habitats.....

- Half the number of people, poor families, elderly, and total value of residential property most exposed to hazards

- Defend the greatest number of people and total property value in Florida, New York and California.

Arkema et al. 2013 Nature Climate Change
INCORPORATING PEOPLE GIVES A DIFFERENT RESULT

Gulf Coast Ecosystem Restoration Trust Fund

- 35% Direct Component: ~$1.86B
- 30% Council-Selected Restoration Component: ~$1.6B
- 30% Spill Impact Component: ~$1.6B
- 2.5% NOAA Science Program: ~$133.3M
- 2.5% Centers of Excellence: ~$133.3M

* Supplemented by interest generated by the Trust Fund (50% RESTORE Council, 25% Science Program, 25% COE)

Clean Water Act Penalties $6.7B

Oil Spill Liability Trust Fund $1.33B

20%
INCORPORATING PEOPLE GIVES A DIFFERENT RESULT

Coastal protection benefits of oyster restoration

Biophysical only

Population weighted benefit of restoration

Lowest  Highest

Hawthorne et al. in prep
INCORPORATING PEOPLE GIVES A DIFFERENT RESULT

Hawthorne et al. in prep
INCORPORATING PEOPLE GIVES A DIFFERENT RESULT

Oyster restoration projects compared to population weighted coastal protection benefits

Population weighted benefit of restoration

Lowest

Hawthorne et al. in prep
MODELS TO ASSESS ALTERNATIVE FUTURES
NATURE-BASED, BUILT, AND HYBRID DEFENSE STRATEGIES

Dow - Freeport, TX

- 5,000 acres on Gulf of Mexico
- Half of U.S. production
- Hurricane prone – partially outside levee system
- Stratton Ridge is 12 km inland; large storms with 6 m or more of surge can extend far inland.
MODELS TO ASSESS ALTERNATIVE FUTURES

Nature-based, built, and hybrid defense strategies

- At least $117M in coastal protection, recreational value, and carbon sequestration
- Support 12 fisheries
- Home to more than 300 wildlife species

Reddy et al. 2015 Integrated Environmental Assessment & Management
MODELS TO ASSESS ALTERNATIVE FUTURES

Galveston Bay

- Avoid $12M in property damage due to marshes
- Marshes protect ~400 people against impact of storms
ACCOUNT FOR SPATIAL VARIATION
BLUE CARBON IN THE BAHAMAS

- Sustainable development planning
- Post-disaster reconstruction and resilience
- Marine Protected Areas siting and management

Mandoske et al. in prep

Total carbon stock
3,513,388,373 TCO2e
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