Incorporating Carbon Management for Climate Change Mitigation into Coastal Management Planning

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Managing carbon

• Why you would want to manage carbon?
• How can you manage carbon?
  – Protect existing stocks (avoided emissions)
  – Create or restore stocks (carbon sequestration)
    • Wetland creation or restoration
    • Manage habitat to enhance carbon stocks
      – E.g., adjust tide gates to flood more but still use for agriculture

Many Blue Carbon projects will occur on the coast
Coastal management issues

- High demand on coastal habitats and resources
  - More than half of U.S. population lives within 50 miles of the coast

- Multiple conflicting uses
  - Economic activities (58% of U.S. GDP): commercial and recreational fishing, transportation, energy production, tourism
  - Ecosystem protection

- Coastal habitats threatened by climate change

Source: [http://stateofthecoast.noaa.gov/](http://stateofthecoast.noaa.gov/)
How coastal managers think

• Primarily **project-based** planning
• **Sector-based** (largely along the lines of agency mandates)
  – Fisheries, transportation, recreation/tourism, land use, energy production, endangered species
• Short-comings recognized, evolving towards more integrated planning
  – Integrated Coastal Zone Management
  – Ecosystem-based management
  – Coastal and marine spatial planning

http://www.oceanconservancy.org/our-work/marine-spatial-planning/
How coastal managers think:
Climate change issues

• Planning approach to climate change has focused on **adaptation** or ensuring resilience to **sea level rise**
  – Hold the line (coastal squeeze unless add sediment)
  – Managed retreat (create space, remove infrastructure, restore)
  – Managed advance (sediment management)
  – Integration with flood management
  – Supporting ecology
  – Reducing social vulnerability

• Greenhouse gas mitigation generally not considered

Areas around San Francisco Bay inundated or vulnerable to inundation under 100-year high-water levels for present-day (blue) and 150-cm sea level rise (red). From Knowles 2010.
How carbon managers think

• Carbon sequestration projects have to meet certain conditions
  – Real
  – Leakage
  – Quantifiable
  – Verifiable
  – Additional
  – Permanence
  – Unambiguous ownership
  – Not harmful
  – Practicality
How carbon managers think

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"The unanticipated decrease or increase in greenhouse gas (GHG) benefits outside of the project's accounting boundary as a result of project activities."

Example: Project to protect forest, but logging simply displaced to an area outside the protected (project) area.
Planning for carbon requires a larger planning scale – temporal and spatial

• Leakage
  – Need to use a regional or larger spatial scale of planning

• Permanence
  – Planning time frame on the order of 100 years (compared to typical 10-year time frame)
  – Need to accommodate sea level rise
Planning for carbon can reinforce good planning practices

• Need to maintain a long-term carbon store
  – Buffers, which would allow wetlands to continue to sequester carbon by tracking sea level rise
  – Important to maintain supply of sediments to wetlands

• Requires a larger planning spatial scale
  – Consistent with an ecosystem-based management approach
  – **Coastal and Marine Spatial Planning** could help ensure a balance with different uses, including natural ecological functions
Planning for carbon management could conflict with other coastal uses

• There can be a conflict between planning for permanent carbon stores (100 years) versus short-term ecological benefits
  – May need to incorporate more high-elevation habitat to accommodate future sea level rise
  – May emphasize long-term development of wetland over immediate needs of endangered species

• Carbon management projects could preclude other uses for a very long time
Carbon management will introduce new trade-offs

• Could lead to a trade-off between carbon sequestration and other ecological values (e.g., endangered species) or ecosystem services in a wetland.

• Could alter decisions about systems with different resiliencies
  – Do we put resources into the sensitive system, which we are likely to lose (but has high current value)?
  – Example: Salinas River (resilient) vs. Elkhorn Slough (sensitive)
Resiliency due to sediment supply

Salinas River in Flood

- Marshes in high sediment areas more resilient to sea level rise
- Restoration more successful in high sediment systems
- Wetlands in low sediment systems will be lost if space is not available for transgression

Van Dyke and Wasson 2005.
Planning for carbon can support good conservation policies

• Conserving wetlands is more effective than restoring them
  – Large carbon stores in existing wetlands
  – Restoration can be expensive, and it takes time to sequester carbon

• Need to focus on policies to protect wetlands
  – Already the policy in U.S., Europe and Australia
  – Extension of REDD framework
  – Promote sustainable use of coastal habitats to reduce destruction of existing habitats
    • E.g., policies to import only sustainably farmed shrimp
Conclusions

• Coastal managers will need to incorporate carbon management projects in their planning
• Carbon management does not fit into project-specific, relatively short-term planning
  – Carbon management projects (especially sequestration) may introduce new conflicts with other
    uses and new trade-offs
• On the other hand, carbon management will reinforce modern coastal planning approaches
  (Ecosystem-Based Management, Coastal and Marine Spatial Planning)
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