The role of ecosystems and ecosystem services in food, water, and energy security

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Ecosystem Services: Benefits people get from ecosystems

Examples of benefits:
1. Protection from storms and erosion
2. Fisheries (recreational and commercial)
3. Recreation & tourism
4. Water filtration
5. Carbon sequestration and storage (coastal wetlands)
6. Cultural services
7. Habitat for other species
Ecosystem Services and the Food-Water-Energy Nexus?
Example 1: Natural & Hybrid Infrastructure

Gray (Built) Infrastructure

- Sea Wall
- Sea Wall and Riprap
- Levee
- Dike

Natural Infrastructure

- Salt Marsh
- Coral
- Mangrove
- Oyster
- Dunes

- Reduce wave energy and erosion and decrease flood extent and area
- Wetlands prevented $625 million of damages in Super Storm Sandy
Benefits of Natural Infrastructure:

- Can strengthen with time
- Can be self-maintaining and has the potential for self-repair after storms
- Can grow and keep pace with sea level rise
- Can be more cost-effective
- Provides benefits all the time

Sutton-Grier et al. 2015
Hybrid Infrastructure (green + gray)
- Can combine strengths of green and gray
- Can use green to protect gray to extend the lifetime or reduce costs

Sutton-Grier et al. 2015
Rebuild By Design: “Big U” Project Provides Climate Adaptation and Recreational Opportunities

- Hard and soft infrastructure with recreational benefits
- Actual Implementation: East Side Coastal Resilience Project
- Integrate flood protection into community, improve water access
- Berms and flood walls or barriers
Rebuild By Design: “Big U” Project Provides Climate Adaptation and Recreational Opportunities
Value of Coastal Natural Infrastructure: What if we protected our natural infrastructure with insurance the way we do our built...?

Can we do this for other coastal ecosystems?
Example 2: Nature/Biodiversity and Human Health

- New evidence suggests important connections between biodiversity and human health and well-being.
Exposure to Nature Improves Human Health

- Reduces stress, blood pressure
- Improves mood, self-esteem, energy, pleasure
- Improves recovery from surgery
- Decreases prevalence of asthma, anxiety
Chronic Diseases and Biodiversity

• Allergy: response to exposure to too much bad stuff
• Allergy: lack of exposure to microbes → hyper-responsiveness to bioparticles
• Microbe-rich environments confer health benefits especially to children
• “Biodiversity” or “Hygiene” hypothesis
  – Loss of macrodiversity → loss of microdiversity → changes in human microbiota and results in variety of disorders
Biodiversity or Hygiene Hypothesis

- Our bodies must learn not to attack:
  - Self
  - Harmless molecules in air (pollen)
  - Gut contents

(Rook 2013)
Finland Adolescent Study

• Analyzed land-use types within 3km radius of homes
• Kids with allergies
  • Lower diversity of habitats
  • Fewer kinds of good bacteria on their skin which have an allergy protective effect (Hanski et al. 2012)
• Loss of contact with diverse natural world is making us sick

Conservation Magazine
Protecting and restoring healthy ecosystems is good for people and the environment and will help ensure sustainable food-energy-water systems into the future.
Thank you!

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