

Candidate Recommendation: A socio-ecological systems approach to Coasts and People convergence research

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ORIGINAL BIG IDEA

33. Given that humans are both an agent of change to coastal landscapes and also the intended target of protection and sustainability, then the coupling of coastal human-natural systems becomes a grand challenge for the science community. Nonlinear feedbacks and stochastic events and responses are part of this coupling and are also where our models, ideas, and understanding of coastal systems typically fail. A CoPe Hub should utilize socio-ecological systems as an organizing feature for the support of 1) basic research, 2) applied research, 3) education, and 4) public engagement in this space. The hub should be organized between the social, natural, engineered, and business spheres, acknowledging existing interactions between these spheres. The leadership structure of the Hub should be developed based on balance between these four spheres and stakeholders should be identified and brought into the process from the onset. Fundamental and actionable objectives should be developed within and across areas and evolve as the system and challenges change. None of the grand challenges around coastal systems will be possible to address without cultivating a new research community that bridges the human and natural science dimensions.

Key Interrelated Categories

1. Engineered Environment: Built, Communications and Transportation Infrastructure (Relevant Disciplines: Engineering, Design, Landscape Architecture, etc.)
2. Business Environment: Industry within Coastal Regions (Relevant Disciplines: Social Sciences, Engineering, Applied Economics)
3. Social, Health, and Safety: Culture, community, public health, social justice (Relevant Disciplines: Economic and Social Sciences, Public Health)
4. Natural Resources and Ecosystems: The bio-physical environment (Relevant Disciplines: Multiple Natural Sciences)

What is your specific* recommendation?

(* Don't be abstract, general, or try to do too much in your recommendations. Try to be specific, actionable, stand alone)

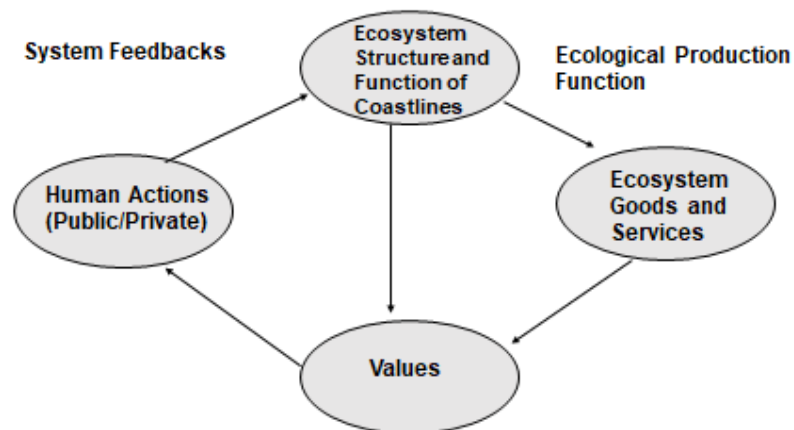
We recommend the development of a CoPe Hub that addresses grand challenges of coastal systems that is:

- Impact driven;
- problem based - encompassing complementary geographical regions;
- has well defined initial research objectives, yet is able to evolve to include new research questions that develop through co-production of knowledge;
- recognizes the dynamic nature and multiple feedbacks within the system; and
- convergence focused, facilitating transdisciplinarity and stakeholder interaction.

The CoPe Hub would

- use the socio-ecological system as an essential organizing feature:
Ecosystem Structure & Function (Biophysical Components & Processes) → Ecosystem Goods and Services (Benefits to Humans) → Influence on Human Behavior/Human Well-being → Ecosystem Structure & Function.

Dynamic Socio-ecological Systems (Heal et al. 2005)



- employ concepts of ecosystem services and co-benefits as means for solving multiple problems;
- involve multiple representative settings - e.g., rural and urban; and
- develop scalable data, tools, and approaches that can be applied and enable optimized decision making on the landscape.

Why is it valuable?

Who does it impact? How? How will the world be better? Who are the stakeholders and who will you partner with to make it stronger?

A CoPe HUB that facilitated the interaction of social and physical scientists and their research would stand to cultivate new, innovative coastal science and also provide the cross-training for graduate students to be integrative, transdisciplinary researchers and practitioners.

A CoPe hub that is impact driven would require the upfront identification of the impacted stakeholders across the social, natural, engineered, and business spheres and should facilitate the creation of knowledge products that are specifically targeted at adaptive, science-based decision making.

By making the hub problem-based, goals can be scalable from local-regional-global and we can make better use of coastal institutions by size and geography. This approach can better utilize local and regional institutions in collaboration with larger research institutions.

By making the hub convergence focused, diverse groups would interact, including local and state governments, communities, NGOs, academia, extension agents/centers, and other boundary organizations (e.g., RISAs), underrepresented groups, engineers, landscape designers.

What's the reasoning or supporting evidence behind it?

Evidence based, fact based, Takes into context current research (hasn't already been tried and failed). How will you validate success? How is it grounded in existing scholarship? Why do this now, above all the other things we could do?

Why Now?

- Coastal population growth is 2x the national average. In 2016, coastal zone counties had population densities of 196.5 people per square mile as compared to 91.4 people per square mile for U.S. counties as a whole (National Ocean Economics Program)
- We are seeing record losses due to coastal disasters (>50% of CONUS economic losses are due to tropical cyclones: 1980-2017)
- Eight US coastal cities are among the world's top 20 in estimated potential average annual flood loss
- Decline in coastal ecosystems due to habitat loss, pollution, HABs
- Expansion of health risks in coastal settings (vibrio)
- End to end, problem based approach has not yet been tried and failed....
- The **social-ecological system** approach (developed by Ostrom in 2009) offers a useful construct for framing efforts focused on coastlines and people because it focuses on the interactions between the natural systems, targeted resources in the system, users of the resources, and governance of that usage, and the factors contributing to or detracting from sustainability or resilience can be identified. Moreover, it is iterative and adaptable.

This CoPe Hub will be successful if it:

1. Saves property, lives, and money
2. Influences decision-makers, policy or governance
3. Helps decision-makers and the public to think stochastically and be more comfortable with uncertainty or at different scales (temporal, spatial)

4. Develops tools that are scalable (local-regional-large marine ecosystem-global)
5. Advances predictive modeling of coastal development, climate change impacts on coastal systems (global to local scales), and any associated feedbacks
6. Broadens participation in efforts to help coastal communities thrive

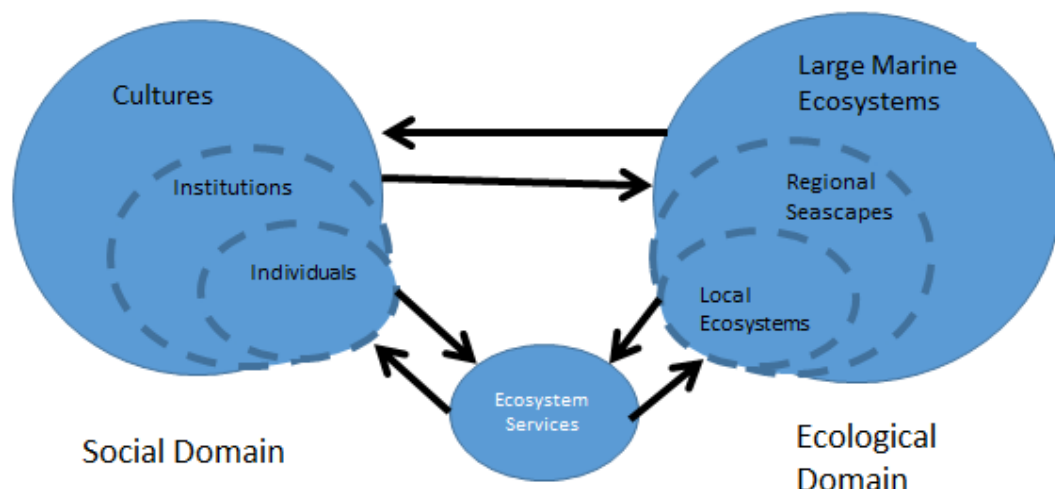
Citations

Aburto, M. O., de los Angeles Carvajal, M., Barr, B., Barbier, E. B., Boesch, D. F., Boyd, J., ... & Ganey, S. (2012). *Ecosystem-based management for the oceans*. Island Press.

Heal, G. M., Barbier, E. B., Boyle, K. J., Covich, A. P., Gloss, S. P., Hershner, C. H., ... & Shrader-Frechette, K. (2005). Valuing ecosystem services: toward better environmental decision-making.

NOTE: These figures below can be tailored to our specific topics. They provide a very general conceptual view of links between the social and natural environments

Coupled Socio-Ecological Systems



Source: Ecosystem-Based Management for the Oceans

