

# CoHUBS - Coastal and Human Understanding: Bridging Scales

## Candidate Recommendation

Authors: Brian Helmuth, Will Kearney, Laura Moore, Rebecca Morss, Megan Mullin, and Alejandra Ortiz

We recommend a CoPe Hub that focuses on understanding how episodic/event-driven coastal hazards and their impacts interact with people's beliefs, risk perceptions, individual and collective risk management decisions, and market forces, to alter the short and long-term evolution of coupled natural-human coastal systems. How can researchers (e.g., physical scientists, life scientists, social scientists, engineers, designers, artists) and stakeholders (broadly defined; e.g., practitioners, community leaders, individuals) co-produce and communicate this understanding to develop equitable pathways to sustainable coastal futures?

Research efforts should address and consider **nonlinearities** across spatial and temporal scales, identify **feedbacks and their effects**, and investigate **tipping points** to assess where, and under what conditions, coastal habitation will be possible in the future. Such a hub could address convergent questions such as:

1. What are the long-term consequences of adaptive (or not) decisions made following episodic events, and how do they feed back to affect long-term coastal change and social systems?
2. At what temporal and spatial scales do changes in the coastal environment affect perceptions of risk and decision making?
3. What adaptation measures can win short-term support from residents and decision makers for benefits that are long-term, collective, and possibly uncertain?

To tackle questions that link processes across different temporal and spatial scales, we recommend a nested design that examines multiple communities situated within a comparable natural coastal system. The hub will focus on a specific geographic region, defined by a type of coastal landscape (e.g. rocky shore, coastal plain/barrier, tropical reefs, deltaic system). Within that coastal system are widely varying human systems with social, economic, political, and built environment characteristics. The Hub's design would entail research at three spatial levels:

1. Generalized models of feedbacks between human interventions and coastal change across different time scales.
2. Data collection across large numbers of communities within the coastal system to allow analysis of individual and collective decisions under varying social and institutional conditions.
3. Selection of case communities stratified based on community size, wealth, physical and ecological setting, and economic and political structures for in-depth study, deep engagement, and co-learning about the ways that short-term community-level decisions shape, and are shaped by, episodic and chronic coastal system conditions. We anticipate working with communities facing different types of challenges at the human/natural interface (e.g. severe erosion, loss of ecosystem services, nuisance

flooding, waste or other infrastructure management, economic transition in a coastal resource industry). Our goal is to incorporate the perspectives of multiple stakeholders from the bottom up, including stakeholders and residents who often have less agency in community decision making.

Efforts should leverage existing institutional structures, government agency efforts, boundary organizations and data/model repositories such as the Community System Dynamics Modeling System.

To harness the power of co-production and enhance co-learning, NSF should fund a **Hub Incubation**, or planning phase, prior to issuing a call to propose the establishment of longer-term hubs. Broadening participation and fostering true convergence across the range of relevant disciplines require meaningful involvement of stakeholders from the start, prior to the development of full Hub proposals.

## 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?

The goal of CoHUB activities will be two-fold: 1) produce cutting edge convergent science that will have direct, positive impacts on residents of the CoHUB's region, and 2) produce replicable models that can be adapted for use in other locations. We recognize that some solutions will be place-based and to some degree idiosyncratic, but our nested design for exploring the relationships between coastal hazards and people and the decisions they make--decisions that are influenced by people's environmental, social and political context--is geared towards understanding underlying processes. The ultimate goal is thus to build on lessons learned from region- or locality-specific examples to build a broader understanding of how science can thoughtfully inform decision making and ultimately help to guide pathways to coastal sustainability. This second goal will further be facilitated through ongoing collaboration and knowledge exchange among the regional hubs.

A core premise of CoHUBS is that sustainable, equitable solutions can only be achieved by fully integrating the opinions, perspectives and worldviews of diverse stakeholders, specifically those most affected by the decisions being made. To this end, the hub will emphasize co-learning and co-production from start to end, including identification of knowledge gaps, carrying out of research activities and overcoming communication barriers. Several mechanisms will enhance inclusivity in the design and execution of experiments and models, and in the effective communication and use of findings.

### Partners:

- Community partners: local government officials, groups/organizations (e.g. homeowners' or neighborhood associations, NGOs), economic leaders, community members
- Outreach partners: boundary organizations, e.g., Sea Grants & RISAs
- Educational partners: K-12, informal educators, citizen science
- Data, modeling, and visualization partners (NOAA, NASA, USGS)
- Other relevant regional, national, and international partners

Co-learning / co-production activities to provide cross-training of participants from traditionally siloed disciplines within the academic community, as well as with partners outside of academia will include:

- Charrettes (problem solving exercises that bring together diverse participants, including researchers and stakeholders, who have not previously collaborated with one another).
- Town hall meetings and partnership with local education centers and libraries to involve community members in co-learning and co-production.
- Visualizations of possible futures (to engage stakeholders in selecting those goals, and discussing the pathways towards achieving them).
- Collaborations with international partners to exchange knowledge about best practices, lessons learned, successes and failures. Internships (e.g. university students work in industry, or non-academics spend time in the hub as a visiting fellow)
- Collaboration with artists, humanists and use of story-telling to develop innovative approaches to communicate convergent research findings arising from Co-HUBS activities.
- Internships (e.g. university students work in industry, or non-academics spend time in the hub as a visiting fellow)

## 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?

Previous research has tended to focus on isolated processes and, even when interdisciplinary, has looked at a limited range of temporal scales, for example the immediate responses of people and populations to an extreme event. As a result, we currently know comparatively little about how physical, social and ecological processes interact and feedback over a range of temporal scales relevant to coastal adaptation.

CoHUB will examine the mechanisms that link event-driven responses to the longer-term consequences of these decisions for coastal resilience. For a variety of reasons, events can motivate critical changes in coastal management: recent experience influences risk perceptions and decision making by individuals; communities respond to the incentives built in to disaster response policies; political decision makers are motivated by evaluations of their performance post-event. We need to understand how post-event decision making contributes to longer-term coastline change and risk and feeds back into future event response. We also need to understand how to co-develop knowledge and communicate about coastal issues in ways that enhance decision making across time scales and including the views and desires of those most affected. Tackling these questions requires the development of richer data characterizing the composition of communities, their natural and physical assets, the factors that influence their attitudes and beliefs, and the policies they undertake over time than what is currently available. It also necessitates critical engagement with communities to understand residents' short-term perceptions and longer-term goals.

This approach will allow the hub to study the evolution of coastal adaptation strategies. While long range visioning providing critical insights into the desires and priorities of coastal

residents, a roadmap to how that visioning can be achieved is limited first by existing conditions, and second by the stepping stones necessary to achieve that vision. An iterative and collaborative process that explores the coupled nature of people with their physical and ecological settings, interacting across time, will allow a deep exploration of how we can use coupled physical and social science research methods to inform a more sustainable future for coastal communities.