United States House of Representatives
Select Committee on the Climate Crisis

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"America's Natural Solutions:
The Climate Benefits of Investing in Healthy Ecosystems"

Questions for the Record

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<u>The Honorable Kathy Castor</u>

1. **Ecosystem restoration and conservation are key tools in adapting to and mitigating the risks from climate change, but we must ensure these types of projects are designed and implemented in a way that secures the needed results for climate, biodiversity, and communities. What are the main challenges and lessons learned from engaging with communities, especially underserved communities, when developing projects to respond to climate change?**

There are several challenges and lessons that have been learned from engaging with communities, especially underserved communities, in adapting to and mitigating the risks from climate change. As a result, and to be effective, projects need to consider the following:

1. **Working with communities is labor intensive** due to the need to develop relationships and ascertain capacity, needs, and constraints. This creates a **need for capacity building for engagement** to get local projects approved and secure funding. Taking time to understand a community's issues and learning how to dialogue and discuss contentious issues (both with disadvantages and advantaged sectors). Having dedicated personnel to meaningfully engage over the long-term and translate the science and advancements would catalyze mitigation actions. This is especially important for climate initiatives to gain stronger support.

2. **Time horizons of projects needs to be long enough to develop meaningful partnerships**. Community-based interventions/projects can often be too small (2-5 years long) and sporadic (i.e., one-off projects) in an uncoordinated manner. Movement towards "phased" projects is a prudent strategy.

3. **Interventions often do not take into consideration the cultural, political, and economic conditions of local communities**. Holistic approaches are needed for identification and valuation of benefits in terms of community health and well-being,

carbon mitigation, green infrastructure, etc.

4. **Critical examination of existing finance and funding mechanisms is needed** to understand who benefits (and who does not), how and why.

5. **Racial zoning and redlining have creating pockets of disadvantage for some and prosperity for others. Planning and development processes/policies/practices need to be linked to environmental justice and social vulnerability** to dismantle systemic inequities and redistribute power and privilege.

6. **There are often mismatches in locations where marine system restoration is permitted versus locations that actually need the ecosystem service**. While more relevant for nutrient storage and removal as opposed to carbon, it is still important when thinking about value to an individual community as opposed to worldwide value.

7. **Climate resilience is about more than physical safety. P**rojects should ensure that they are looking at all adaptation measures within a holistic vision of what is needed, wanted and how to get there. Then they can determine how NNBF's (Natural & Nature-Based Features) fit into adaptation plans.

Publications

- https://link.springer.com/epdf/10.1007/s13280-022-01723-1?sharing_token=Qbbsklk_AHjsOx2G0VYTAfe4RwlQNchNByi7wbcMAY5-7v4OXTL-91pP_yLEd9vxp9W23e9Cyb55Kir0ElbW1GZdRPek2yHux2-OQk3ATZ_f-hexVWQ4gBsCk1RoM2Cqa9yUNZbnc4_4XzYB8X3YrAWKBxMIw7isY_xGSFlnLcQ%
- https://cdn.sei.org/wp-content/uploads/2021/09/spotlight-on-social-equity-finance-and-scale-nbs-2021.pdf
- https://royalsocietypublishing.org/doi/10.1098/rstb.2019.0120
- https://www.sciencedirect.com/science/article/pii/S0301479720306812
- https://www.nature.com/articles/s42949-022-00047-z
- https://www.liebertpub.com/doi/10.1089/env.2020.0054

Websites

- https://www.aaas.org/events/community-and-organization-panel-discussion-green-infrastructure
- https://n-ewn.org

Related Sea Grant Projects

- ***Southeast and Caribbean Climate Alliance***, funded by NOAA's Climate Program, Regional Integrated Science and Assessments (RISA): https://gacoast.uga.edu/outreach/programs/coastal-hazards/southeast-caribbean-climate-alliance/
- ***PLACE:SLR (Program for Local Adaptation to Climate Effects: Sea-Level Rise)***, a partnership between Sea Grant programs in the northern Gulf of Mexico has:

    - Provided several tools for climate mitigation at the local level: www.GulfTREE.org, localslr.org, bit.ly/Future-Flooding)
    - Assembled best practices on stakeholder engagement and testing the findings: https://coast.noaa.gov/digitalcoast/training/underserved-communities.html
    - Described their experience in putting tools into practice (video): https://drive.google.com/file/d/1J1Lp7PEWrBZt5jE-tHPI4l03tjuu4E-l/view?usp=sharing
- ***Climate Smart Floridians*** helps an individual identify what they can do to reduce their own greenhouse gas emissions. Demonstrating that there are small, actionable, steps, one can do to address climate change makes it seem more approachable, and could help overcome the general distrust of science (especially when it comes to climate change research).

2. Certain habitats, including forests, grasslands, and wetlands, can provide needed carbon sequestration. However, different habitats provide different benefits. What are the similarities and differences between terrestrial and marine carbon sequestration? What additional research on blue carbon is needed and why?

The quest for carbon storage strategies should be addressed through both terrestrial and marine projects because we are going to have to find and use every mechanism to have to sequester and store excess carbon. That said, finding the most efficient and least expensive ways to sequester carbon over the long run is important. There are at least three contexts in which marine and terrestrial carbon storage differ:

The first primary difference between marine and terrestrial carbon storage is that in marine systems, carbon is typically buried in the soil instead of in plant biomass (like forests), which makes marine carbon storage less susceptible to many hazards (e.g., forest fires). While that is true, marine carbon storage remains susceptible to things like resuspension due to plant loss and hurricanes, and to the disruption of the sediment that might increase rates of decomposition. There is some debate on what happens if plants die; the living plants with a healthy root system keep the sediments in place so if they die, the long-term storage may be lost. Direct measurements of this loss though are rare and vary probably depend on the scale of the loss and on site-specific wave energy (see Aoki 2021 and references there in). The Fourqurean paper estimated carbon stocks for seagrasses and discusses some of those differences. The classic paper is McLeod 2011.

The second primary difference in marine and terrestrial carbon storage is that we have the ocean, which can absorb carbon. A consequence of this is acidification. Recent work suggests that coastal blue carbon habitats might not be as efficient at carbon storage as originally thought because of dissolved inorganic carbon export (Santos et al. 2021).

The third primary difference in marine and terrestrial carbon storage is with respect to shellfish where carbon is sequestered from photosynthesis, storage as biomass, and through calcification (shell growth). Fodrie et al. 2017 found that reefs next to marshes were carbon sinks while reefs isolated on mudflats were carbon sources. It is also important to remember that calcification produces CO_2. Grabowski et al. discusses the ecosystem services of oysters. But, the location of these habitats really matters, not only for carbon storage (Fodrie et al) but also nutrient removal (Smyth et al.).

Research needs should seek to determine:

1. the sources and magnitude of variability in estimates of carbon sequestration;
2. a common system of assessment and measurement in support of the development of payment systems and trading programs;
3. the importance of size and scope of restoration projects on the trajectory or timeline of carbon sequestration; better understanding the role of alkalinity, organic and inorganic carbon and the carbon cycle in general in coastal systems;
4. interactions between multiple stressors like acidification and eutrophication;
5. drivers of greenhouse gas emissions and burial rates from coastal habitats to move beyond sequestration and look at the balance between services and disservices;
6. the contribution of outwelling of dissolved carbon as well as carbon sequestration;
7. how blue carbon habitats in tropical and subtropical ecosystems differ from other climates and land-based systems;
8. the extent of permanent carbon storage (net carbon balance) from shell growth;
9. the role and importance of macroalgae as a carbon sink; and
10. what management approaches promote carbon sequestration.

References

Aoki: https://www.frontiersin.org/articles/10.3389/fmars.2020.576784/full
Bezerra: https://www.science.org/doi/10.1126/science.abo4578
Dencer-Brown: https://link.springer.com/article/10.1007/s13280-022-01723-1
Fodrie et al: https://royalsocietypublishing.org/doi/full/10.1098/rspb.2017.0891
Fourqurean: https://www.nature.com/articles/ngeo1477
Grabowski et al: https://academic.oup.com/bioscience/article/62/10/900/238172
McLeod: https://esajournals.onlinelibrary.wiley.com/doi/full/10.1890/110004
Needleman: https://link.springer.com/article/10.1007/s12237-018-0429-0
Oldfield: https://www.science.org/doi/abs/10.1126/science.abl7991
Santos et al: https://www.sciencedirect.com/science/article/pii/S0272771421002146#fig1
Smyth et al: https://besjournals.onlinelibrary.wiley.com/doi/full/10.1111/1365-2664.12435
Van Dam et al: https://www.science.org/doi/full/10.1126/sciadv.abj1372