

D I A L O G U E

MANAGING THREATS TO BEACHES FROM STORMS AND RISING SEAS

SUMMARY

More severe storms and rising sea levels resulting from the changing climate pose a threat to ecosystems along the U.S. coast. These include beaches, dunes, wetlands, and marshes, which provide significant environmental, recreational, and economic benefits. Practices to sustain these ecosystems are available, but are not well understood, face legal and financial obstacles, and have not been widely implemented. On January 25, 2023, the Environmental Law Institute hosted a panel of experts who explored measures and practices for sustaining beaches and dunes in the face of a changing climate. Below, we present a transcript of that discussion, which has been edited for style, clarity, and space considerations.

Jeff Peterson (moderator) is a Visiting Scholar at the Environmental Law Institute, Co-Facilitator of the Coastal Flood Resilience Project, and author of *A New Coast: Strategies for Responding to Devastating Storms and Rising Seas*.

Sean Vitousek is a Research Oceanographer at the Pacific Coastal and Marine Science Center of the U.S. Geological Survey.

Charles Lester is Director of the Ocean and Coastal Policy Center in the Marine Science Institute at the University of California, Santa Barbara.

Lauren Blickley is Hawaii Regional Manager at Surfrider Foundation.

Travis Brandon is an Associate Professor of Law at Belmont College of Law.

Jeff Peterson: Our goal for this discussion is to provide an overview of measures and practices that will sustain beaches and beach ecosystems threatened by more severe storms and rising seas. To give everyone a common base of information about the risks that beaches face in a changing climate, we developed a read-ahead document that you can find on the Environmental Law Institute website.¹

I want to summarize some of the key points to keep in mind. We can all agree that the nation's beaches are a national resource of outstanding ecological, recreational, and economic value. But sadly, beaches are at risk of ero-

sion and related damages to habitat and wildlife by storms and eventual inundation by rising sea levels.

A warming climate is causing an increase in the number of the strongest storms. The state of Florida, for example, has reported that its critically eroded beaches increased from 217 miles in 1989 to more than 400 miles just last year, mostly due to storm impacts.² Sea-level rise, however, poses the most critical risk to beaches. The National Oceanic and Atmospheric Administration predicts future sea levels rising along the U.S. coast by about 1.3 feet by 2050, around four feet by 2100, and more than seven feet by 2150 in their intermediate scenario.³

Future sea-level rise will force beaches to shift landward where geography makes this possible. Where inland migration is not possible due to geographic features, such as rocky cliffs or shorelines, or to barriers from human development, like roads or other structures, beaches will be lost to inundation and become open water. The Intergovernmental Panel on Climate Change estimates that between 10,000 and 15,000 miles of sandy coasts in North America are expected to retreat by about 300 feet by the year 2100.⁴

The U.S. Geological Survey (USGS) has estimated losses of between 30% and 60% for California beaches by

Editor's Note: This Dialogue is the second in a two-part series on coastal ecosystems and their resilience to storms and sea-level rise. The first part, addressing coastal wetlands and marshes, appeared in the April issue.

1. ENVIRONMENTAL LAW INSTITUTE, MANAGING THREATS TO AMERICA'S BEACHES FROM STORMS AND RISING SEAS: READ AHEAD PAPER (2023), <https://www.eli.org/sites/default/files/files-general/2023-01-25%20Beaches%20Webinar%20Read%20Ahead%20Paper%20Final.pdf>.

2. OFFICE OF RESILIENCE AND COASTAL PROTECTION, FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION, CRITICALLY ERODED BEACHES IN FLORIDA (2022), https://floridadep.gov/sites/default/files/FDEP_Critically%20Eroded%20Beaches_06-2022_Final_1.pdf.

3. NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, GLOBAL AND REGIONAL SEA LEVEL RISE SCENARIOS FOR THE UNITED STATES (2022), <https://aambpublicoceanservice.blob.core.windows.net/oceanserviceprod/hazards/sealevelrise/noaa-nos-techrpt01-global-regional-SLR-scenarios-US.pdf>.

4. Roshanka Ranasinghe et al., *Climate Change Information for Regional Impact and for Risk Assessment*, in CLIMATE CHANGE 2021: THE PHYSICAL SCIENCE BASIS. CONTRIBUTION OF WORKING GROUP I TO THE SIXTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (Valerie Masson-Delmotte et al., eds. Cambridge Univ. Press).

2100.⁵ In North Carolina, 14 of 17 beaches studied were expected to have eroded all the way back to the main road on the Outer Banks.⁶ The future of beaches along the U.S. coast will partly depend on the vagaries of storms and the rate of acceleration of sea-level rise at specific places, but the responses to increasing losses of beaches by government and coastal property owners will also influence the health of beaches.

Simple population growth in coastal areas poses a risk to beaches because it drives up density of structures and services. The population living right along the coast is expected to double by 2060.⁷ In addition, as homes and structures are increasingly recognized as being at risk of sea-level rise, some property owners behind or around beaches will invest in protection structures such as sea-walls or bulkheads. These hardened structures limit the landward migration of beaches, and can result in stripping away of the beach and narrowing or vanishing of beaches altogether.

Finally, some local governments invest in beach nourishment projects to add sand to beaches, often to protect high-value property or recreational uses. These projects, though, involve some environmental and ecological harm. Sand often washes away, making those benefits temporary.

This Dialogue will address what we can do to protect existing beaches and facilitate their landward migration. In general, the panel will be talking about three key strategies to help sustain beaches and support shifting ecosystems to higher ground.

First is building a broader understanding of the climate change risks to coastal ecosystems among decisionmakers and the public. That will help build a foundation for efforts to sustain the ecosystems. Better recognition of the risk can help provide a foundation to apply some diverse measures to protect the assets.

Second is acquisition of title or easement. This is a key tool to protecting existing coastal ecosystems and the uplands that will become pathways for landward migration. Acquisition might be by local, state, or federal government or nonprofit organizations.

Finally, a third set of tools involves local, state, and federal government permitting and regulations—permitting of coastal structures or regulations, for instance, to discourage development in ecosystems and in migration pathways. Ideas and innovations in each of these three areas are coming along well, but more severe storms and rising seas are also coming. The country is in a race to sustain existing beaches and facilitate their landward migration ahead of these risks.

The Coastal Flood Resilience Project has published a white paper recommending that the country respond to the threat of coastal storms and sea-level rise to the nation's beaches by advancing some major new initiatives to deal with these risks.⁸

I'm delighted to introduce the expert panel with deep knowledge of these topics. Sean Vitousek is a research oceanographer at the Pacific Coastal and Marine Science Center of the USGS, where he develops numerical models to predict coastal climate change impacts. He was born and raised in Hawaii, and received his Ph.D. in civil engineering and environmental engineering from Stanford. He's also a surfer.

Charles Lester is the director of the Ocean and Coastal Policy Center in the Marine Science Institute at the University of California, Santa Barbara, where he researches, writes, and advises about sea-level rise, coastal resilience, and other aspects of coastal law, policy, and management. Charles previously worked for the state of California and the California Coastal Commission for 20 years, including serving as the agency's fourth executive director from 2011 to 2016.

Lauren Blickley is the Hawaii regional manager for Surfrider Foundation. She has worked in Hawaii for more than 10 years on a range of climate change issues, focusing on research, local legislation, and public outreach. She's working to realize proactive solutions to a range of coastal resilience challenges.

Travis Brandon is an associate professor at the Belmont University College of Law, where he writes on issues of coastal land use planning, administrative law, and environmental justice.

First, each of the panelists will give a short presentation describing their work in this area. Then, they will respond to some general questions about options for protecting beaches in the face of more severe storms and rising seas. Third, we'll take questions from the audience. With that, I would like to give the floor to Sean Vitousek.

Sean Vitousek: I'll provide an introduction to the science of coastal erosion. It's a California-centric view since that's where I'm located, but the processes are common throughout the nation's coast. We've had a pretty interesting run here in California.

At the USGS, we study coastal hazards. If you're going to try to assess coastal flooding and erosion on a given beach, what are the processes that you'd want to consider? Well, there are a lot of them, but I will focus on two major factors: waves and storms, and sea-level rise.

Sea-level rise is a big one here in terms of the fate of the coastlines. Prof. Gary Griggs from the University of California, Santa Cruz, has provided a projection about future sea-level rise in California.⁹ There are pretty big uncertainty

5. Sean Vitousek et al., *A Model Integrating Longshore and Cross-Shore Processes for Predicting Long-Term Shoreline Response to Climate Change*, 122 J. GEO-PHYSICAL RSCH.: EARTH SURFACE 782 (2017).

6. BIPARTISAN POLICY CENTER, *IMPACTS OF GLOBAL WARMING ON NORTH CAROLINA'S COASTAL ECONOMY* (2007), <https://bipartisanpolicy.org/report/impacts-global-warming-north-carolinas-coastal-economy/>.

7. Barbara Neumann et al., *Future Coastal Population Growth and Exposure to Sea-Level Rise and Coastal Flooding—A Global Assessment*, 10 PLOS ONE e0131375 (2015), <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0118571>.

8. COASTAL FLOOD RESILIENCE PROJECT, *HELPING AMERICAN BEACHES SURVIVE MORE SEVERE STORMS AND RISING SEAS* (2021), https://www.cfrp.info/_files/ugd/2450cf_113085aabe1f4caf8269815df303e337.pdf.

9. GARY GRIGGS ET AL., *CALIFORNIA OCEAN PROTECTION COUNCIL SCIENCE ADVISORY TEAM WORKING GROUP, CALIFORNIA OCEAN SCIENCE TRUST*,

bands associated with the melting of big ice masses like Greenland and Antarctica. But for the most part, if you look at sea-level rise projections going out to 2100, they're between about .5 meter and 2.5 meters. You can imagine there'd be a pretty significant difference between .5 meter and 2.5 meters, or up to 10 feet of sea-level rise, on the coastline going forward in the future. This is something that we're really worried about and interested to see what's going to happen.

I'll talk a bit about erosion processes. In particular, this is about sediment supply, or how sand gets on beaches. For example, in California, there's probably three major factors. One is fluvial sediment inputs, which is sediment from rivers. A lot of the beaches are sustained by these big fluvial discharge events.

Another one is from eroding cliffs and dunes. A lot of the sand is in the landward region of the beach, and that sand can maintain the existence of beaches over time provided that sand is available and not impounded by infrastructure or things like that.

Finally, there's a significant portion of beach sand in California that is sustained by artificial beach nourishments from dredging of harbors or from offshore, particularly in southern California. This is just an introduction to the sediment supply. Then, that supply gets moved around by a couple of different factors.

There are a number of factors contributing to erosion at a given beach. The biggest one is probably waves. Also, in the future, sea-level rise will be a pretty big factor. And of course there are things, like river damming, that affect the natural sediment supply and how much sediment is delivered to the coastline or shoreline armoring, how much sand is available from eroding beaches or eroding dunes.

Looking at the wave factor, I'm going to give some examples of how waves drive coastal change. One is longshore transport, or littoral drift, by which waves can drive sand from one region to another. Basically what happens is, whenever you have waves at an angle, they drive longshore currents, which can move sand. So, you can have beaches that move around from shifting wave directions.

Another example of wave-driven coastal change is a cross-shore equilibrium transport. Basically what that means is that large waves often will erode the beach face and move that sand offshore into sandbars. Then, once the waves get smaller, that sand can move back onshore and those beaches can recover.

In California in particular, we see a very large seasonal excursion in the shoreline position. We have our biggest waves in the wintertime. Our beaches erode back 20 to 30 meters, and then they recover in the summertime when the waves are smaller.

Finally, I'll talk a bit about sea-level-driven coastal change, which is sometimes referred to as the Bruun Rule. In essence, the rule says that the beach wants to maintain an equilibrium profile or shape; basically, the same shape as

sea level rises. There are many geologic and hydrodynamic reasons why a beach profile exists the way that it does. As sea level rises, it wants to maintain that same shape.

If you have sea-level rise and you want the shoreline in a horizontal position to stay exactly where it is, then essentially you need a volume of sand in order to maintain that same profile at a higher sea-level rise state. You'd need a source of sand in order to achieve that. When you don't have a source of sand, what happens instead is that you have an erosion of the beach face or the dry beach and a deposition offshore. In that situation, the sediment is all conserved. Essentially, the beach profile has migrated upward with sea-level rise, but it has also migrated landward with sea-level rise.

The Bruun Rule says that the amount of coastal recession is related to the sea-level rise multiplied by the inverse of the beach slope. For the most part, that generally means the amount of coastal erosion can be on the order of 20 to 50 times whatever sea-level rise is. This is a huge uncertainty. We don't know that it's 20. We don't know that it's 50. There may be some environments where it's 100 times sea-level rise.

There's a lot of complicated hydrodynamic and geologic processes that cause some pretty significant uncertainties in how much retreat you get based on how much sea-level rise you get. Again, we don't know, but we're guessing we'll get a horizontal recession distance of about 20 to 50 times the vertical sea-level rise. So, if you have one meter of sea-level rise, you might have 20 to 50 meters of erosion, which is pretty significant.

At the USGS, we study these things in a variety of ways. I'll give a few examples. One is using aerial photos. For each aerial photo, we can digitize where the shoreline used to be. Then, we can look at trends in those shoreline positions over time. The classic example of that is the USGS National Assessment of Shoreline Change Project, which is a very big and important historic product coming out of the USGS. We're trying to modernize that with more data.

The advance of machine learning and deep learning, of artificial intelligence algorithms, allows an accurate identification of things like shoreline position from satellites. Satellites provide an incredible wealth of data above historical aerial photos, so this is a tremendous resource to track shoreline change over time. The satellite information can also be integrated with computer models to predict potentially what the shoreline is going to look like in the future.

For example, we have a model of wave heights for a given ocean beach in San Francisco that's driving the shoreline back and forth. Our model is sort of predicting what the shoreline is. Maybe it's not doing the best job until we have a lot of observations of shoreline change to automatically calibrate that model. The model is trying to optimize itself to best fit observations or the agreement between model and observations. After we stop calibrating the model, we try to understand how well it does against observations, then run that forward to the future. This is how we're working to try to predict what's going to happen to shoreline change in the future.

RISING SEAS IN CALIFORNIA: AN UPDATE ON SEA-LEVEL RISE SCIENCE (2017).

You can look at some of our modeling products on the Our Coast, Our Future web portal.¹⁰ It offers some flood model projections and shoreline model projections for California. We're working on trying to do this throughout the United States. We basically have California finished. I'm hoping we will have similar results released in a matter of weeks for the South Atlantic region.

We're also currently working on the sandy portions of the Gulf of Mexico. We're working on the Pacific Northwest with some folks at Oregon State University and the University of Washington. We're working in Hawaii with my former master's degree adviser, Chip Fletcher. And Alaska is also on our to-do list in the next couple of years. We don't necessarily have plans for the North Atlantic or the Great Lakes, but that should hopefully come relatively soon.

It's definitely important to understand what's going to happen with future coastal erosion and coastal flooding. We're trying our best to work on that at the USGS.

Charles Lester: It's useful to think about sea-level rise not necessarily as something new, but as an acceleration of something that's been happening. In fact, 50 years ago, the U.S. Army Corps of Engineers (the Corps) observed that a vast portion of California's coastal shoreline was constantly being lost by the natural geologic process of erosion.¹¹ The California Natural Resources Agency responded similarly when the state passed the Coastal Act—that shoreline erosion problems have plagued California for many years. Many problems still exist and new ones are likely to occur.¹²

That was almost 50 years ago. And here we are with new problems. Wouldn't it be cool if we had 50 years of management to learn from across this 50-year erosion trend that we've just gone through? Well, we do. We started managing the coast in California in 1972. There was a proposition that passed.¹³ Beach protection, and the ability to access our beaches, was the central reason why we established this management program.

One of the ways we did that over the years was by using the regulatory process to require beach access easements for development permits. All of these developments, in a stretch of coast in Malibu for example, were required to dedicate the beach in front of the development to the public for access purposes in exchange for the development permit.

We've also got multiple so-called vertical access ways to enable the public to get from the first public road to the beach. We have a lot of history of that. We were quite suc-

cessful in the early years requiring these easements until the U.S. Supreme Court got involved in 1987 in *Nollan v. California Coastal Commission*,¹⁴ and said, wait a second, maybe you don't have a really good, rational connection for that kind of regulation. You can see the chilling effect it had on the Coastal Commission's use of this tool. Nonetheless, there are many of these easements out there, and they've been an important part of protecting beaches for the public over the past 50 years.

Let me shift to another piece of this puzzle, which is how we regulate hazards in relationship to beaches. The law says a couple of things. One is that new development must be safe and must never need shoreline protection.¹⁵ As a matter of course, over the years, the Coastal Commission has used development setbacks to make sure that this is happening, and also has put public access in many cases into this area of setbacks—for example, a subdivision in Pismo Beach.

They've also done things like re-subdivide existing legal parcels. For example, in Monterey, where multiple parcels, some of which went into the surf zone, were reconfigured and moved back in order to protect the beach and the dune system and allow more space for that natural beach to function.

Also, we have about three decades of experience using what might be called "rolling easements." In addition to requiring the setback, we require the property owner to assume the risk of being in that location, to agree to never build a seawall in the future, and to require removal of that development if and when necessary. There are a lot of these easements out there now.

It's still early in the scheme of things as to how these will do in the courts, but we do have some development permit decisions where they've been implemented. One example is in Santa Barbara where the Ritz-Carlton Bacara resort had a beach house. It became endangered. It's been removed recently because of a condition in the original 1980s permit for the hotel that effectively required the structure to be removed when it becomes endangered. What remains to be seen is what will happen with the hotel, which, in my interpretation, has the same effective requirement by virtue of a requirement to maintain the blufftop trail between the hotel and cliff edge, without using a seawall.¹⁶ That should be an interesting story in the future.

On occasion, the commission has actually recommended denial of redevelopment on the beach. For example, a house was recommended to be denied because it would be a public nuisance to the beach resources there and to the public. In the aftermath of the recent storms we had, it is clear that it is a very active location with a lot of sea-foam coming up.

10. Our Coast, Our Future, *Home Page*, <https://ourcoastourfuture.org/> (last visited Mar. 8, 2023).

11. Charles Lester et al., *Shoreline Retreat in California: Taking a Step Back*, 38 J. COASTAL RSCH. 1207 (2022), <https://doi.org/10.2112/JCOASTRES-D-22A-00010.1>; U.S. ARMY CORPS OF ENGINEERS, NATIONAL SHORELINE STUDY (1971).

12. JOHN S. HABEL & GEORGE A. ARMSTRONG, ASSESSMENT AND ATLAS OF SHORELINE EROSION ALONG THE CALIFORNIA COAST (1977).

13. California Coastal Zone Conservation Act of 1972 (Proposition 20); Charles Lester, *CZM in California: Successes and Challenges Ahead*, 41 COASTAL MGMT. 219 (2013).

14. 483 U.S. 825, 17 ELR 20918 (1987).

15. CAL. PUB. RES. CODE §30253; Charles Lester, *An Overview of California's Coastal Hazards Policy*, in *LIVING WITH THE CHANGING CALIFORNIA COAST* 138-62 (G. Griggs et al. eds., 2005).

16. California Coastal Commission, Coastal Development Permit 4-85-343 (1985).

In addition to the new development policy, we also have a policy for existing development.¹⁷ This has been much more difficult to deal with because essentially the law says that existing development has certain entitlements to protection. It's been very hard to resist cumulative seawall development in urbanized areas.

For example, there's a wonderful cliff along Solana Beach that has been gradually transformed into kind of a faux Disneyland vertical wall over time. We've long known the impacts of seawalls on beaches that Jeff mentioned. But we also see what happens when you armor the coastline and the beach can't recess. We have multiple examples of that in California, where, say, a revetment has made the beach much narrower than it would be or could be.

We know what happens when we build seawalls. The Coastal Commission over the years has quantified that impact and routinely used it in permit conditions as a mitigation measure for seawall development. One of my favorite examples is a condominium in Monterey where we required a \$5.2 million mitigation fee to go to beach access acquisition in the area for the projected recreational value loss of this beach. We know this is going to happen. We know what the impacts are. The question is, what do we do about it?

Another example that I like from California is Fort Ord, in which the U.S. Army proposed to demolish a bluff top facility, as the structure was no longer savable. We asked the Army to also remove the revetment that had been put there over the years. When we removed the revetment, the beach naturally restored itself pretty easily given the former dune environment there. So, we know that we can improve things if the conditions are right.

In Half Moon Bay, similarly, the commission used its enforcement authority to order the removal of a revetment that was replaced in an emergency situation to protect the 18th green on a golf course. Removing the revetment restores the beach, making a slightly more challenging golf hole.

The Coastal Storm Modeling System (CoSMoS) of the USGS projects what might happen to the shoreline in Del Mar, for example, with one meter of sea-level rise by 2100.¹⁸ Clearly, sea-level rise does present an increasingly problematic accelerating trend. What are we going to do if this development is still here in 2100? There won't be a beach. And you can show the same thing up and down the coast.

We're confronting this question of the coastal squeeze, of conflict with community. How do we strike the right strategy for what we care about with beaches with respect to the existing development? We've started to talk about adaptation pathways. What are the triggers for taking action? What are the actions we're going to take and what's the sequence of those actions?

Looking at things along a spectrum—from protection to nature-based solutions like a dune-covered revetment

and replenishment proposed in Malibu, using groins, elevating structures, managed retreat—what is the right combination of interventions and over what sequence and what periods of time? A critical piece of that pathway thinking is, what is your vision for the coast? What are you trying to accomplish?

A good example is what the city of Monterey has done in the past with a stretch of coast that was basically mixed commercial development. They had a vision to open up the coast to make it a public beach park. They did that over about 40 years. There were no takings of private property. It was all voluntary acquisitions. Gradually, they made it into a beach park. The vision was what drove their incremental actions over a long period of time.

Unfortunately, they didn't know that this very same area would now have to deal with sea-level rise. They're engaged in a new visioning process where they're wondering whether to build the seawall and try to stop the ocean from coming in or consider putting in a viaduct for the public road and reconfigure the shoreline.

In this visioning exercise, they emphasized there would be two miles more of new coastline and bike trails—more beaches for recreating. What are the benefits of a certain kind of reimagined coastline? It's that imagination, I think, that's critical. But it brings us back to the original conflict we had with the Supreme Court and the access easement approach, which is how to handle the fact that the tidelines are going to keep moving inland. If we don't figure out how to offset that trend, we're going to have some legal conflict around the fact that the tideline is intersecting with private property.

One of the things I've been working on is public trust issues. As a legal matter, the Coastal Commission has started to take this up as a condition in its permits—meaning not only will you remove the development but, if it becomes located on public trust lands in the future, you will remove that development.

There's a lot of potential legal conflict out there in the future if we don't figure out alternatives to protect the beach. I'm going to end with a summary of a case from the North Pacific where the Corps brought a trespass action in federal court against homeowners for revetments on tidelands. The court essentially concluded, based on common-law doctrine, that the homeowners did not have a right to permanently fix the property boundary absent consent from the United States or, in this case, the Lummi Nation, which was the trust holder of the beach area.¹⁹

We've got ourselves in a situation where, if push comes to shove, we've got a lot of property owners on one side of the tideline in the public trust area and not as many property owners on the inland side. I don't think it's going to be a private-property issue. It's going to be a common-law question of what is constitutional in the context of common-law rights.

17. CAL. PUB. RES. CODE §30235.

18. Our Coast Our Future, *Science and Modeling*, <https://ourcoastourfuture.org/> (last visited Apr. 7, 2023).

19. *United States v. Milner*, 583 F.3d 1174, 39 ELR 20232 (9th Cir. 2009).

Lauren Blickley: Aloha kākou. I'm the Hawaii regional manager with the nonprofit Surfrider Foundation. Surfrider is a coastal advocacy organization. We are focused on protecting our oceans, our waves, and our beaches for all people through our powerful activist network. I want to acknowledge that I'm presenting from the island of Maui, which is part of the larger lands that make up the Kingdom of Hawaii and the homeland of native Hawaiians.

Most people, when they think of Hawaii, probably think of large, beautiful sandy beaches, which we do have. But of course our coastal zone is very dynamic here in the islands. It is very seasonally dynamic as well. Even though we have some large beaches and even though we see the dynamics at play, the reality is that the majority of our sandy beaches on the islands of Oahu, Kauai, and Maui are chronically eroding.

It's in this context, and very similar to the context that Charles was talking about, that Surfrider has increasingly been concerned about the future of our coastlines, and the future of accessing coastlines. However, we have to make sure that we have coastlines to access and focus on coastal protection. I want to share a project we've been working on over the past couple of years to specifically consider solutions to addressing erosion hazards and improving coastal resiliency, while also ensuring that we have robust and healthy coastlines.

In addition to the chronic erosion that we have, we know that with sea-level rise we're going to continue to see these erosion hazards increase. It will mean thousands of residents being displaced, and a lowball estimate of 65,000 structures that may be chronically flooded. Not only are roads and coastlines becoming impassable, but a lot of public infrastructure is being significantly and severely threatened as we continue to see sea levels rise. These are very real and present threats that we are dealing with locally.

It's important to remember that coastal erosion is not necessarily a bad thing. It's natural, but it's being exacerbated by climate change and sea-level rise. The issue is what Charles was talking about. We have built too close to our shorelines, and therefore we're seeing this significant threat to public and private property, as well as the increasing loss of our public resources and our public coastlines and beaches.

Unfortunately, here in Hawaii, we've largely taken a very reactionary and piecemeal approach to addressing coastal hazards and shoreline erosion. Increasingly, we are seeing many homeowners take matters into their own hands. And we've largely had the perspective that we need to harden the shoreline. We need to protect, protect, protect. And when we talk about "protect" in this context, it's typically protecting public or private property.

In addition to jury-rigged sandbags and tarps that we consistently see on the North Shore and other places in Hawaii, we also have a legacy of shoreline hardening with seawalls. The unfortunate thing again is that if we don't have a shift in perspective, if we don't take a more proactive approach, we're very likely going to continue to see exacerbated erosion throughout the islands and continued loss of our shorelines.

Luckily, in Hawaii, from a context of coastal preservation and protecting beaches, we do have a number of very strong laws and support for public beach access and public beach protection. Beaches are a public trust in Hawaii, and the state is constitutionally obligated to protect them. Over the past couple of years, we've also had a number of very important policies that have been passed to further support beach protection, including a prohibition on any additional shoreline hardening such as seawalls²⁰; as well as, most recently, a bill that went into effect in May 2022 that requires buyers of coastal property to actually sign a disclosure agreement that acknowledges the risk of buying homes within the coastal zone.²¹

When considering how to improve coastal resiliency and protect our public beaches, there are two major challenges that we face in Hawaii. First, unlike California, Hawaii has a bifurcated coastal zone. It is split in a jurisdiction between the state and county.

That's created a lot of major issues and challenges in terms of enforcement with different laws and regulations within the coastal zone. It's also created challenges in terms of creating proactive plans because we're dealing with multiple agencies, multiple jurisdictions on multiple different levels. That again creates more red tape and more challenges. It's easier to kick the can down the road.

Second, our toolkits are pretty small in terms of financing or policies that can help us move away from the shoreline in some of these really vulnerable areas. Those are two big gaps that we've been delving into as a community.

So, what do we do? That's the million-dollar question and part of the reason I think we're all here today. There's obviously not a single solution and one-size-fits-all approach. But as we're seeing these additional erosion hazards, as we're seeing the loss of our shorelines and the threats to private property, and as Surfrider's gotten more involved with this throughout the islands, we've connected more with Sea Grant, and around mid-2020 started putting our heads together on how to address these immediate threats.

Where could we really focus our efforts? Where could we get the biggest bang for our buck? Where are we seeing immediate threats, and individual property owners that could utilize tools and support? Where are the opportunities and options to improve these coastlines? Maybe it would be through dune restoration.

We essentially settled on the North Shore of Oahu, which stretches from Ka'ena Point all the way up to Kahuku Point. With its surf breaks, this is probably one of the most iconic shorelines in the entire world. Not only that, but there are significant cultural and traditional values along the stretch of coastline for native Hawaiians. There are a

20. S.B. 2060 (Haw. 2020); *Coastal Zone Management Bill Becomes Law, Mitigating Erosion and Rising Sea Level Threats*, MAUI NEWS (Sept. 17, 2020), <https://mauiNOW.com/2020/09/17/coastal-zone-management-bill-becomes-law-mitigating-erosion-and-rising-sea-level-threats/>.

21. S.B. 474 (Haw. 2021); Lauren Blickley, *SB474 Is a Victory for Hawai'i Beaches*, SURFRIDER FOUND. (July 9, 2021), <https://hawaii.surfrider.org/sb474/>.

lot of important factors at play along this coastline, which is another reason we thought it was an important starting point and pilot area for us to figure out some solutions.

We came together with our partners at Sea Grant and SSFM International, and we convened what we called the North Shore Coastal Resilience Working Group. Ultimately, it was our goal with this group to sit down and talk as stakeholders and community members about solutions. What do these solutions look like? What's feasible? What can happen on these different time frames? How do we really ensure that we're protecting this iconic coastline for years into the future? We had a series of six meetings that wrapped up in summer 2022.

Adaptation pathways are planning tools that allow us to evaluate different solutions over a phased timescale. Like Charles mentioned, there are certain triggers of these different actions—maybe the high wash of the waves or a specific amount of sea-level rise that happens. We saw quite a bit of support for phased adaptation options and talking about adaptation in a phased manner. Another important part of that adaptation pathway is community collaboration and input. I want to highlight those efforts.

We released our final report for the working group last October.²² Within the report, we identified three key hot spots throughout this stretch of coastline and areas that we thought would be most effective to focus on first, that have the most immediate concerns and opportunities. We also laid out some of our adaptation pathways planning as well as identified some critical concerns and recommendations.

We ended up not adding and assigning triggers to each of these different strategies. We didn't have the expertise. We didn't have the capacity to do that part of the exercise. But I think what was really important is that we were able to sit down as a group and outline these different timelines, from intermediate to mid-term and also longer term. We were able to talk very candidly about different strategies, and to identify the needs and next steps for each strategy.

It was a good exercise to not only identify the strategies, but to decide whether some are for Surfrider and some are specific to state and local county agencies. We do have next steps identified, so this was an important exercise that our group went through.

We also identified and laid out a number of critical concerns, really considering that this is an immediate issue. This is not an issue where we can kick the can down the road. We literally during the middle of our meetings had the house slide into the ocean at Rocky Point. This is happening. Lives are at risk. Properties are at risk. Public infrastructure is at risk. We need to be addressing this now.

The other piece of our critical concerns revolves around the lack of a toolkit. We don't have a lot of options from either a homeowner's perspective or a public and state/local agency perspective in terms of how to support increased

coastal resiliency in these areas through proactive planning, which in many cases also includes managed retreat.

We laid out a number of recommendations for immediate action as well. Again, most of these revolved around the need for proactive planning, the need to increase our toolkit when it comes to being able to exit these critical and vulnerable coastal areas, and the need to create comprehensive strategies.

We've also seen from the release of this report a number of our state and local officials really jumping on these recommendations, seeing this high-priority need, and then supporting it through various legislation. It's going to be a very active legislative session for us here in Hawaii. In addition, I think that expanded community discussion is critical to seeing the success of this and continuing the work that we've done as the working group.

In addition to the final report, a huge outcome was informed community members, who could go out and talk to their friends and family and other community members about what we did within the working group. It was an important opportunity for us as working group members to get a different perspective and to share these different thoughts, whether it's from the homeowner perspective, the community perspective, or the state and local agencies' perspective.

One big hope that I've always had for this project is that we could utilize it as a template and expand these working groups to other locales—whether that's in Hawaii or places on the mainland that may really benefit from having these discussions. I hope that this can be used for a template in other areas that are experiencing similar challenges.

Of course, we didn't solve all of the issues on the North Shore, all of the coastal erosion issues in Hawaii, but it was an important starting point. We've already seen some action taken from it and continue to see that detailed evaluation and planning.

Travis Brandon: I want to focus somewhat narrowly. We've talked a lot about the negative consequences of shoreline armoring. I want to focus in on the regulation of coastal armoring here in the Southeast, where I'm located, and use that as a jumping-off point for some of the larger implications for regional coastal management.

I want to start by pulling out a data point from the read-ahead material, which is that at the moment, 14% of the nation's coastline is armored, and if current trends continue, we're looking at something like 30% by 2100.²³ Here in the South, given the topography, large areas of the Gulf are already armored in a kind of bathtub fashion. So, I think we're a little bit ahead of the curve there.

But thinking nationwide, it's worth considering exactly how that armoring is going to happen. It's going to happen unless we change the way that we work in a kind of parcel-by-parcel and permit-by-permit approach by private landowners. One important step in trying to figure out how to have a sustainable coastline that's not fully armored

22. NORTH SHORE COASTAL RESILIENCE WORKING GROUP, ADAPTIVE COASTAL MANAGEMENT RECOMMENDATIONS, ACTIONS AND STRATEGIES (2022), https://20811975.fs1.hubspotusercontent-na1.net/hubfs/20811975/web-North-Shore-Coastal-Erosion-Report_102122_Web.pdf.

23. ENVIRONMENTAL LAW INSTITUTE, *supra* note 1, at 3.

is thinking about how to get to grips with the question of permitting coastal armoring and development.

I want to look at how in the Southeast federal and state permitting interact and how some weaknesses in our permitting systems in the region tend to facilitate armoring. I'm going to start by looking at one federal policy that encourages and endorses coastal armoring here, which is the Corps' Nationwide Permit (NWP) 13.²⁴ Then I'm going to give a broad overview of coastal regulation in the Southeast, and highlight across several states some weaknesses and areas of concern that make armoring more likely in the region.

The bigger takeaway here is that as we're looking at the Southeast, given some of the challenges in our permitting programs, looking forward, we're going to need more federal planning and funding in order to support region-wide initiatives. I'm not sure that we have the state-level will to do that.

I want to look at the Corps' role in permitting coastal armoring structures. Because a lot of armoring projects occur in intertidal areas or coastal wetlands, they often implicate the Corps' jurisdiction under §404 of the Clean Water Act (CWA).²⁵ Section 404 requires permits for filled projects like coastal armoring. I want to focus particularly on §404(e), which authorizes general permits.

The idea behind the general permit program is that these permits are meant to streamline permitting for activities that cause only minimal adverse environmental effects. One of the general permits that the Corps has authorized is NWP 13, which allows for bank stabilization activities in the form of riprap revetments or bulkheads. We've already talked a lot about the problems with armoring, but suffice it to say I think it's a stretch to suggest that even small armoring projects have only minimal adverse environmental effects.

I want to highlight two features of NWP 13 that can make it particularly troublesome. First, unlike other nationwide permits that authorize more intensive development, NWP 13 doesn't require a preconstruction notice (PCN) before proceeding with construction. The PCN is submitted to the local district engineer of the Corps; it provides a basic description of the project and lets the engineer determine whether the project fits the terms of the general permit. Without a PCN requirement, it's a lot harder for district engineers to gather data on the usage of the permit and ensure compliance.

Second, NWP 13 puts a federal stamp of approval on armoring structures up to 500 feet in length. That's a lot. That allows for some very large armoring projects going forward with minimal environmental review depending on the jurisdiction. And given that a lot of coastal properties are less than 500 feet in length, it facilitates a parcel-by-parcel process of creating this kind of bathtub effect.

NWP 13 is important. I don't want to overstate its importance—there are a lot of jurisdictions where local regulations are stricter than this and require more review—but in many areas of the Southeast, particularly along the Gulf Coast, NWP 13 plays a significant role in coastal permitting decisions. Mississippi, for example, has basically adopted NWP 13 for permitting coastal bulkheads. It also has a lot of influence on permitting bulkheads in coastal wetlands throughout the Southeast, where state restrictions are more lax.

The Corps estimates that NWP 13 could authorize roughly 15,200 armoring projects over five years, directly affecting some 920 acres of waters of the United States.²⁶ The ease of permitting under NWP 13 has also encouraged hard armoring and discouraged softer erosion controls. In 2017, the Corps adopted NWP 54²⁷ for living shorelines, which are softer armoring options, but in many jurisdictions it's still easier to build a bulkhead than a living shoreline because of the restrictions in NWP 54 that aren't present in NWP 13.

If we're thinking about immediate steps we could take in order to reduce armoring of coasts and wetlands to slow that down a bit, one place we could start is that the Corps should consider eliminating NWP 13, or at least modifying it so that it's at least as strict as NWP 54. That said, the Corps' facilitation of armoring in the Southeast is just one small part of the whole challenges that we face at the state level.

I want to highlight some areas of concern in the region of how we permit development. The first is a lack of uniformity and responsiveness in the Southeast in how we draw development lines. Most of the southeastern states rely on a system of setback lines to guide coastal development permits. Those setbacks are jurisdictional lines that identify a boundary where seaward development is not permitted.

But every state in the region does this somewhat differently, which makes it really hard to do regional planning and thinking. We've got one group of states, including Alabama and Georgia, that use relatively fixed setback lines. These are setback lines that are drawn from existing land features, such as sand dunes, and in some cases older existing buildings, or other kinds of fixed elements of the terrain.

The advantage of a fixed setback approach is that it's more uniform. It's easier for property owners and developers to calculate where it is, but the huge downside is that it's much slower to change and adapt to erosion and sea-level rise. Compounding that problem, many states that use fixed setback lines lack statutory mechanisms to update them. That can lead to some extreme cases, like Alabama's notorious Dauphin Island, where storms and sea-level rise have eroded the beach to the point where the legal setback

24. Army Corps of Engineers, Nationwide Permit 13—Bank Stabilization (Feb. 25, 2022), <https://www.swr.usace.army.mil/Portals/41/docs/missions/regulatory/2021%20NWP/NWP-13.pdf>.

25. 33 U.S.C. §§1251-1387, ELR STAT. FWPCA §§101-607.

26. Army Corps of Engineers, Decision Document—Nationwide Permit 13, at 97 (Dec. 27, 2021), <https://usace.contentdm.oclc.org/utills/getfile/collection/p16021coll7/id/19777>.

27. Army Corps of Engineers, Nationwide Permit 54—Living Shorelines (Feb. 25, 2022), <https://www.swr.usace.army.mil/Portals/41/docs/missions/regulatory/2021%20NWP/NWP-54.pdf>.

line has long been offshore—meaning that anything goes for development. That’s obviously pretty extreme. But if states continue to use these kind of fixed setback lines, we’re almost certainly going to see more examples like this as sea-level rise continues to erode the land that’s oceanward of that jurisdictional line.

Other states like Florida and South Carolina use a more dynamic approach, applying localized erosion rates in order to establish setbacks. Florida, for example, uses a 30-year erosion projection based on erosion and storm data for the area. This is obviously a better approach. It’s more adaptive for providing coastal management. It also allows for the incorporation of more and better data, like the improvements of the ocean mapping that Sean talked about. I think this is a good approach, but the problem in these states is that they only update those erosion rates infrequently.

In South Carolina, the erosion rates are only updated every seven to 10 years. Florida does so as a discretionary action when authorities determine that changes in the data have rendered the old setback line ineffective. Having this kind of decade-long gap in updating erosion rates is way too slow to respond effectively to the problems caused by rising seas.

Also, because of the gap and because of the significance of that recalculation of erosion rates, the process of updating erosion data becomes highly politicized because it threatens the interests of coastal developers. That leads to a second worrying trend when it comes to coastal permitting in the region, which is that even if states have good retreat or beach management policies in place, when push comes to shove and developers start having permits denied, there’s been a tendency to back down.

I’ll give a couple examples. In 2016, North Carolina, which has all in all a pretty good coastal management program in place, started allowing local governments the authority to establish their own development lines for permitting at a local level. Unsurprisingly, in many cases, that led to development closer to the beach and closer to that erosion. North Carolina also has a ban on hard coastal armoring, but it routinely undermines that policy by permitting the installation of temporary sandbags for emergency erosion control. In some places, these sandbags have been in place for 30 years.

Similarly, South Carolina in 2018 revised its Beach Management Act to remove all references to the previous policy of retreat that used to be a part of the statute and replaced them with a policy of beach preservation, which means holding the line. This is a process that’s ongoing in South Carolina. The legislature is currently threatening to wipe out all of the existing coastal management regulations unless the Department of Health and Environmental Control updates them to focus on that preservation mandate.

There are lots of other examples throughout the Southeast, but I probably don’t need to tell you that state politics in the South are not currently favorable to long-term regional environmental planning.

Finally, several southeastern states have policies that facilitate coastal armoring, such as actively encouraging

filling in gaps in coastal armoring. Florida is the most notable of these, both because of how aggressive the statute is regarding this gap-filling policy and how large and important its coastline is. Florida largely exempts bulkheads, seawalls, and riprap from permitting where it’s used to fill in the gaps between existing armoring. This creates a kind of chain reaction where, once a few owners get hard armoring permits, all of their neighbors follow suit.

Looking at all of these policies and looking across the Southeast, I want to conclude in a way that gestures forward to some of what we are planning to talk about as a panel. These examples illustrate that, perhaps, especially in the Southeast where we have so many different jurisdictions and so many different interests at play, we’re going to have a hard time solving the problem of ongoing armoring or coastal development at a permit-by-permit level.

That’s especially true given the possibility that the current Supreme Court may be more aggressive regarding regulatory takings and other issues of property rights, as Charles mentioned earlier. I think the only way that we’re going to get to long-term sensible beach planning is through federal intervention. We need some sort of comprehensive beach plan and coastal planning. The only realistic mechanisms here in the Southeast through which that happens are, for example, the Coastal Zone Management Act (CZMA).²⁸

We also need to change our funding incentives. In the Southeast, we deal with a lot of hurricanes. We need to stop focusing our disaster funding on rebuilding and put more into buyout programs. We also need to change the way that we manage federal flood insurance.

Jeff Peterson: Let’s go right into the second section, which is a general discussion among the panel of a couple key questions. We’ll start with the issue that Travis raised a minute ago, the state CZMA programs. The good news is that some state CZMA programs do look at beaches and dunes with the idea of protecting them. But some do not. A question to the panel is, what role should the CZMA program play in adapting the nation’s beaches to more severe storms and rising seas? For example, should the national program require that each state add to their existing plans a new element focused specifically on sustaining beaches?

Charles Lester: That’s a really challenging question. I alluded at the outset of my presentation that most of the states have basically a 50-year history of coastal management under the CZMA, which has largely been process-oriented and funding-oriented. In California, anyway, the most important regulation was happening at the state and local levels.

On that relationship between them, the federal government was providing broad guidance and support and funding to our program. I think it would be interesting to start tying the funding to more substantive outcomes perhaps, like protection of beaches or beach sustainability. But that

28. 16 U.S.C. §§1451-1466, ELR STAT. CZMA §§302-319.

would be pretty challenging to get through at the federal level, especially when you look at the contrast between a place like California and North Carolina, for example, where it's pretty dramatic in terms of how people perceive what the issues are and how to deal with them.

At the same time, as I talked about it, we've had a hard time with seawalls ourselves. So, it's a complicated policy question. To establish substantive goals at the federal level would be an interesting political discussion. I can't imagine it resolving itself in favor of beaches, and on the other hand, not necessarily against beaches, but in our current state, how does anything get resolved asking that question?

I'm not necessarily against beaches, but in our current state, how does anything get resolved asking that question? Even in Santa Cruz, last week when the president was here looking at the storm damage, the lead-in from the national news was, how are we going to better protect and harden our infrastructure? It's not about saving beaches.

Travis Brandon: I agree that there are some significant political obstacles to making any progress on that at the federal level, particularly at this moment. But in terms of thinking and long-term vision, the CZMA is perhaps underappreciated in terms of ways that we could leverage those questions of federal funding.

There's a lot of federal funding that goes to states in terms of dealing with their coastal zones. To the extent that we could condition that funding on more progressive policies, the CZMA offers the opportunity to do that in a way that perhaps has been somewhat underappreciated. Now whether we can actually put that into play through legislative action, I similarly have my doubts.

Jeff Peterson: We should turn to one of the other big federal investments now in beach management. Many of you mentioned beach nourishment—adding sand to sustain a beach. In general, do any of you have suggestions for how that federal program might be improved? What do you think of a suggestion that future beach nourishment projects be tied to a requirement for identifying a landward migration corridor and taking steps to be sure that the dunes that we're sustaining, the beaches that we're protecting, can move landward as sea levels rise?

Charles Lester: My thinking on beach replenishment has evolved a little bit. I've looked at what's been happening in places like Florida, North Carolina, and New Jersey, and wonder about the long-term prospects of that. Even in southern California, where we spend a lot of money putting sand periodically in the same places only to have it disappear. It raises a lot of issues for me about how we pay for that and who pays for it, especially if it's not coupled to longer-term policy goals like you suggest.

I've been thinking about it in terms of a combination of strategies that might be considered over time in connection to these longer-term movements or adaptation pathways. For example, revisiting the question of groins, which have not been favorably looked on in California since we started proactively regulating, but do play a role in trapping sand

and maintaining beach environments for longer periods if done appropriately and in a way that doesn't affect down-coast jurisdictions.

Maybe a strategically placed groin with sand retention—not even necessarily replenishment, but allowing the natural forces to build up sand—is a good interim step while we plan and put in place the mechanisms that Lauren was saying we don't really have yet and that we've been trying to get in California to provide for managed retreat in a way that isn't threatening. That allows for voluntary acquisition and movement over time to allow a beach environment to maybe persist longer.

It's really complicated as to what kinds of things are going to work, where and how much they will cost, and who is going to pay for them. That's partly the importance of what I heard Lauren talking about in terms of a smaller-scale subregional, community-based planning process to look at those kinds of trade offs.

Lauren Blickley: The managed retreat issue has been a big discussion point. I think that we're grappling with exactly what I brought up earlier, and then also this very real feeling from homeowners of "this is my home." What do we do? What do we do particularly now in light of the fact that their actions are then taking away this public trust?

It's really contentious. We have had to have some hard discussions as a community. That was why we drew it down to this subregional and community-based level. We could sit there as neighbors, and not just the state or the county, and talk through some of these things. It's interesting because some of the homeowners were saying, if I could get a buyout, I would take it. This is a homeowner who's been there since the 1960s.

I think that there's a will in some cases, but we don't have the tools yet. We've actually been looking at California for some of those tools. We've been looking at the Blue Acres Buyout Program in New Jersey. It's so challenging because, when people think of managed retreat, they think of a single policy. But it's not. It's a series of policies. It's a series of tools. It's a series of different funding mechanisms. You want state and local funding, but you also want potentially federal funding.

Maybe there are a lot of different ways to do it. We're looking at special community districts, special finance districts that maybe we could apply to certain areas, such as the North Shore, where people in certain areas are paying more not necessarily in terms of a property tax, but some level of tax that then goes into funds to support certain levels of buyout.

There are definitely areas where we need to move away from the shoreline. But the reality is multilayered and multifaceted. It requires a number of different policies and a number of different funding mechanisms.

Charles Lester: I think that's well said. Just on the California option, we have had a bill in the legislature in the past two years to allow local governments to basically borrow money to acquire hazardous properties and then lease them back to residential use until such time as they're no longer viable. It went through the legislature two years in

a row. The governor vetoed it two years in a row, because of the sensitive political conversation around buying out residential homeowners.

There is movement in that direction, but I agree it takes time to unfold. It's not like we haven't used property laws under the U.S. Constitution to take property before for many other things, like highways. It's something that's provided for. The ideas of acquiring property for the public interest are out there. But how do you make it happen over time, so that people who are there now aren't immediately threatened by these policy ideas and you have a rational way to get there?

Jeff Peterson: Let's take some questions from the audience. There's been some interest in the USGS work related to the CoSMoS planning tool that Sean talked about, and when that might be available for the Hawaiian Islands and for Louisiana.

Sean Vitousek: We have a pretty complicated timeline for the different regions. We have an extensive data review process that goes into all these model projections, which makes it difficult to say when specifically one product might be available. For the South Atlantic—Miami through Delaware—we're hoping that we will have flood projections, erosion projections, vertical land motion projections, and groundwater flooding projections available within a few weeks or potentially months.

For the Gulf, Hawaii, and the Pacific Northwest, we're probably looking realistically at a timeline of one or two years. Alaska will probably be on the order of three years. If we work on New England or the Great Lakes, that would probably be on the order of four or five years.

If there's a strong interest in a particular area, please feel free to contact me or my supervisor, Patrick Barnard, who's in charge of the overall CoSMoS project, whereas I focus on the coastal erosion side of things. But we have other components that I think are equally important in terms of overall coastal hazard vulnerability, like flooding projections and groundwater hazard projections, in many low-lying coastal regions.

Groundwater flooding hazards are going to be tremendously impactful. We can build the beaches and dunes as much as we want, but it's just going to go through the groundwater unless we're pumping constantly.

Those multi-hazard projections are really important in all of these. Like I said, with a timeline, we're hoping to cover most of the open coastal areas within the time frame of two to three years. Hopefully, fingers crossed, subject to our review process.

Jeff Peterson: There are a couple of questions about financing and the success that local or state governments have had with financing either property buyouts or establishing setback corridors. Also, are there any further examples that you would point to that haven't come up yet?

Lauren, you mentioned the Blue Acres Buyout Program and the lack of financing right now. In Hawaii, that would be something that needs work. Does anyone on the panel want to add any ideas on that?

Travis Brandon: I'll say, on financing, that a lot of the managed retreat that we've seen in the United States has taken place through the Federal Emergency Management Agency (FEMA) buyout program. FEMA, through the Hazard Mitigation Grant Program, finances buyouts. I think that the Blue Acres Buyout Program was related to that, and now the Building Resilient Infrastructure and Communities Program is a relatively new one. These are programs that have a lot of potential for targeted buyouts in areas that are subject to routine flooding.

Charles I think quite rightly talked about the power of eminent domain when it comes to buyouts. But there's also an unpleasant history in the United States of displacing socially vulnerable communities in buyouts. One thing that's a concern for me is that as we move forward, we are inevitably going to see and need more buyout programs. It's very important that they be designed in ways that provide for the needs of socially vulnerable communities.

Looking at the history of FEMA buyout programs, there have been some studies recently showing how they raise some important social justice concerns and tend to direct a disproportionate share of money to wealthier and less racially diverse communities.²⁹ It's important that we find ways to make sure, as we do move forward with plans of relocation and realignment, that we're incorporating those kinds of social justice concerns.

Charles Lester: That's the reason why we need to do that kind of thinking within the larger planning context and at the community scale. Because it's part of a strategy and a vision for the future of the shoreline in the communities. If we're just implementing a piecemeal targeted buyout after the fact, after the repetitive flooding or emergency action, we're prone to that kind of bias as opposed to deciding where we want it to be and how we are going to pay for it to get there.

We've got lots of other kinds of financing mechanisms out there in the world of wetland restoration. For example, the Bay Area has a property fee for every county ringing the bay to pay for wetland restoration and retreat options. Over time, they're raising millions of dollars to do that.

A financing district is also an option in shoreline hazard abatement, which is on the table and now in effect in a state law in California, too, which is to establish a special district—like Lauren was referring to—that would come along with funding to achieve the goals of that district in an equitable way.

Lauren Blickley: I'm glad you brought up equity because that's been something we've also been discussing quite a bit in Hawaii. One of the big points of discussion is, why are we buying out these coastal homeowners for millions?

29. See, e.g., Rebecca Hersher & Robert Benincasa, *How Federal Disaster Money Favors the Rich*, NPR (Mar. 5, 2019), <https://www.npr.org/2019/03/05/688786177/how-federal-disaster-money-favors-the-rich>; Anne R. Siders, *Social Justice Implications of U.S. Managed Retreat Buyout Programs*, 152 CLIMATE CHANGE 239, 248-49 (2019).

These are multimillion-dollar homes. Why are we buying them out?

That's the question I've had to sit with on a personal level over the past couple of years and thinking about those trade offs, which is really different depending on which area of coastline you're at as well. But like what we're seeing on the North Shore and a lot of places in Hawaii, the alternative is that we're losing our public beaches. We need to have the buyout structured in a way that prioritizes the social and environmental justice aspects.

Someone asked in the chat if we need to triage. Absolutely we're going to have to triage, but we're also going to have to add in these different mechanisms to ensure we are talking about structuring. We didn't introduce such a bill this year. We're still trying to figure it out. Again, we took from California's managed retreat bill,³⁰ which I've read quite a bit and pondered how we could apply it in Hawaii.

What we are also saying is, could we have a stepwise approach where the first boxes, the priorities, go in case of potential buyouts to native Hawaiians, then to a certain level of income or a certain level of house? And what does

that look like as you get down to our prioritizing? But then you also have to triage of course.

Identifying those areas, particularly these very specific spots like we identified in our hot spots, was important in our coastal working group. The hot spots are the first places along a stretch of coastline that we need to focus our efforts on.

It is a mix of triage. It's a mix of ensuring that you have community buy-in and a community vision. That's huge. That's what Charles is getting at. What is that vision? It's important to create that vision so it doesn't feel like, oh, we're just buying out rich people on the coastline. What's the long-term vision in the area?

Charles Lester: I know this is a question about ecology that we haven't touched on much, but I think that has to be a part of the triage too. Where are the places we should be really prioritizing for the ecological values and functions of beaches? That's the conflict between ecology and people a lot of times. It's not just about finding the right places for the public trust to use the resource, but the ecology also.

30. S.B. 1293, 2019-2020 Leg. Sess. (Cal.), <https://ww2.arb.ca.gov/2020-senate-bill-1293-allen-ben-sea-level-rise-revolving-loan-program-dead>.