ENVIRONMENTAL LAW INSTITUTE WEBINAR
Managing Threats to America's Beaches from Storms and Rising Seas
READ AHEAD PAPER
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This Read Ahead *paper provides background information for the Environmental Law Institute webinar:* Managing Threats to America's Beaches from Storms and Rising Seas.

Value of Beaches

The nation's beaches are a national resource of outstanding ecological, recreational, and economic value.

- Beaches and dunes help support the diverse functions of estuaries and provide cultural and recreational opportunities for millions;
- Beaches and dunes also provide diverse ecosystem services, including rich invertebrate communities and food webs that are prey for birds and habitat for diverse wildlife; and
- People living near the coast benefit from the buffer that beaches and dunes provide against the high winds and waves.

The economic value of beaches is significant both nationally and for coastal communities. In 2014, the *National Climate Assessment* reported that:

> "coastal recreation and tourism comprises the largest and fastest-growing sector of the U.S. service industry, accounting for 85% of the $700 billion annual tourism-related revenues, making this sector particularly vulnerable to impacts from climate change."

Much of this tourism is associated with the estimated 2 billion beach visits per year by over 200 million Americans.

Climate change related impacts on beaches will have significant economic impacts with some states hit especially hard:

- Florida tourism could lose as much as $167 billion by 2100;
- North Carolina is projected to lose $3.9 billion over the next 75 years; and
- In Hawaii, the loss of a single beach (i.e., Waikiki beach on Oahu) has an estimated cost of up to $2 billion annually.

Risks to Beaches: Coastal Storms and Rising Seas

Beaches along the U.S. marine coastline are at risk of erosion and related damages to habitat and wildlife caused by storms and eventual inundation by rising sea levels.

Coastal storms pose a major risk of erosion to beaches, harm to the ecological and recreational values of beaches, and damage to property and public infrastructure. Unfortunately, a warming climate is causing an increase in the number of the strongest storms. These storms bring more extensive coastal flooding, higher storm surges, and increased rainfall.

Sea level rise, however, poses the most critical risk to beaches. The National Oceanic and Atmospheric Administration predicts average future sea level rise along the US coast of 1.3 feet by 2050, almost 4 feet by 2100, and 7.2 feet by 2150 under the "intermediate" scenario. The change coastwide could be over 7 feet by 2100 in the "high" scenario. Some regions, such as the Gulf Coast, can expect sea level rise of over five feet by 2100 in an "intermediate" scenario.

Future sea level rise will force beaches to shift inland where geography makes this possible. Where inland migration is not possible due to geographic features (e.g., cliffs or rocky shoreline) or human development (e.g., roads, structures, or coastal armoring) beaches will be lost to inundation and become open water.

Projected Beach Losses

There is no national assessment of the risks that more severe storms and rising seas pose to the nation's beaches, but beaches have already been harmed and these losses will increase in the future. The International Panel on Climate Change reported in August 2021 that:

> "the total length of sandy coasts in North America that are projected to retreat by more than a median of 100 m by 2100 under [climate change scenarios] RCP4.5 and RCP8.5 is about 15,000 km and 25,000 km respectively, an increase of approximately 70%."

Several studies have projected beach loss for specific coastal regions.

- The U.S.G.S. estimates loss of 31-67 percent of California beaches by 2100.
- In North Carolina, a study found that 14 of 17 beaches are expected to have eroded all the way to the road by 2080.
- The State of Florida reported that its "critically eroded" beaches increased from 217 miles in 1989 to 426 miles in 2022, but made no projection of future beach loss.

Future Risks to Beaches

The future of beaches along the United States coast will partly depend on the vagaries of storms and the rate of acceleration of rise in sea level at specific locations. But the responses to increasing loss of beaches by government and coastal property owners will also influence the future health of beaches.

- **Coastal Population Growth:** Simple population growth in coastal areas poses a risk to beaches because it drives up density of structures and services (e.g., roads) and utilities (power and water). Population living right along the coast (i.e., at elevations of 33 feet and lower) is expected to double by 2060. Some of the development will occur behind existing beaches and create a greater obstacle to their landward migration.

- **Coastal Protection Structures:** As homes and structures are increasingly recognized to be at risk, some property owners behind or on beaches will invest in protection structures, such as seawalls or bulkheads. An estimated 14% of the shoreline is hardened today and these structures are most often found in places with high housing density and high storm frequency. By 2100, some 30% of the coast is expected to be hardened if the current rate of hardening continues.

  These hardened shorelines are intended to protect property and limit erosion, but they have the negative consequences of limiting the landward migration of beaches and natural replenishment of sand, stripping away beaches until they narrow or vanish altogether. Other harmful impacts of coastal structures include increasing erosion at the edges of a structure harming surrounding ecosystems, "reduced diversity and abundances of marine fauna when compared to natural shorelines...", and reduced nutrient filtration, carbon storage, and recreational value. Some of these impacts can be minimized by use of "living shorelines" that use plants, sand, and rock in place of "hard" engineered structures.

  Although these structures require a federal permit, and some states have adopted limitations, permit decisions do not now occur in the context of a larger plan for protecting beaches. Without the context of a larger plan, these permit decisions can lead to increased coastal armoring, damage to ecosystems, and limits on landward migration of beaches.

- **Beach Nourishment Projects:** Finally, some local governments invest in costly beach nourishment projects to add sand to beaches, often to protect high-value property or the viability of a local economy. One database reports over 2,000 beach nourishment projects involving over 1.3 billion cubic yards of sand, at a total nominal cost of over $7 billion. Although beach nourishment projects involve some ecological harm, sand often washes away so the benefits tend to be temporary.

  In addition to providing only temporary benefits, beach nourishment projects will increasingly be unable to keep up with natural losses due to more severe storms and rising seas, requiring ever more expensive investment in this short-term solution. Commenting on beach nourishment along the coast of North Carolina, a coastal geologist noted that beach nourishment had increased from 12 miles in the 1980s to 127 miles in 2017, and that "this whole system is collapsing."

  These projects are often implemented by the Army Corps of Engineers on a 65% federal cost-share basis with local governments, with federal costs of about $50 million annually. Even if dramatic increases in funding for temporary solutions could be found, much of this funding would likely be at the expense of investments in more permanent solutions.

In sum, without a focused effort to help beaches adapt to a changing climate, many of these critical natural resources will be lost in the coming decades.

Measures to Sustain Beaches

The webinar will address what can be done to both protect existing beaches and facilitate their landward migration. In general, the panel will describe three key strategies to help sustain beaches and support shifting these ecosystems to higher ground.

- **Education and Planning**: Broader understanding of the climate change risks to beaches and coastal ecosystems among decision-makers and the public is an important foundation for efforts to sustain these ecosystems. Better recognition of risks can provide a foundation to support development of plans to identify migration corridors, and to apply diverse measures to protect these assets in timeframes that are appropriate to the risk.

- **Land Acquisition and Investments:** Acquisition of title or easement is a key tool to protect both existing beaches and ecosystems and the uplands that will become pathways for their landward migration in response to more severe storms and rising seas. Acquisition might be by local, state, or federal governments or nonprofit organizations.

- **Permits and Regulations:** Local, state, and federal governments have a range of regulatory tools for managing existing ecosystems and protecting landward migration pathways. Permitting of coastal structures, such as seawalls, is a tool to reduce their impacts on beaches (e.g., by denial of a permit or use of permit conditions, such as requirements for living shorelines). State and local governments can use regulations to discourage development in ecosystems and migration pathways. And the federal government can require that federally funded projects be directed away from flood risk areas and toward higher ground.

Ideas and innovations in these three areas are coming along well, but sea level rise is accelerating. So, the country is in a race to sustain existing beaches and facilitate landward migration ahead of rising sea levels.

The *Coastal Flood Resilience Project* (CFRP) has published a white paper recommending that the country respond to the threat that coastal storms and rising seas pose to the nation's beaches by advancing a major new effort to define the risks to these vital natural resources and implement plans for their long-term survival (see overview attached).

Attachment

Overview of Coastal Flood Resilience Project
Beaches White Paper:
Helping American Beaches Survive More Severe Storms and Rising Seas
9.22.2021

This *White Paper* recommends that the country respond to the threat that coastal storms and rising seas pose to the nation's beaches with the following measures:

1. **Assess Beach Health:** The federal government should assess the current condition of beaches and evaluate the potential for their landward migration as storms and sea level rise push the shoreline landward.
2. **Support State Beach Plans:** The federal government should provide states with scientific, technical, and financial support to develop and implement plans for the long-term survival of beach systems within the state, including measures to facilitate landward migration of beaches as sea level rises, to promote the use of living shorelines, and to address the interests of disadvantaged communities. This work should be in coordination with related plans such as Coastal Zone Management plans and National Estuary Program plans.
3. **Develop Future Beach Plans:** For specific, high priority beaches identified in state plans, the federal government should provide grants to states to develop and implement plans for sustaining the beach system, including land acquisition and related measures needed to facilitate landward migration and implementation of measures to sustain the recreational, ecological, and economic values of beaches.
4. **Make Federal Investments Consistent with Plans:** Federal investment and permit decisions should be consistent with beach plans and should eventually be limited to beaches for which plans have been developed and approved.
5. **Identify and Remove Abandoned Structures:** The federal government should identify structures on beaches and set priorities for removal of structures that pose the greatest risk to public safety and navigation.
6. **Provide Major Federal Grant Support to Sustain Beaches:** Federal agencies should use existing funds to support expanded efforts to sustain beaches and Congress should authorize and appropriate substantial funds for statewide beach plans, for more detailed plans for high priority beaches, and for removal of abandoned structures.