Coastal Flood Resilience Project

WHITE PAPER

Helping American Beaches Survive More Severe Storms and Rising Seas 9.22.2021

The *Coastal Flood Resilience Project* is a coalition of organizations working for stronger programs to prepare the United States for the more severe coastal storms and rising sea level resulting from a changing climate.

The coastline of the United States includes thousands of miles of beaches that are a natural resource of outstanding recreational, ecological, and economic importance. Coastal storms damage beaches and property. More importantly, rising seas will force beaches to migrate landward where geography and the absence of other barriers makes migration possible. Many beaches hemmed in by geography or human development will be inundated.

This *White Paper* recommends 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. Specific recommended measures include:

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.

The Biden administration can implement some of these measures using existing authority and resources. For example, the administration could begin assessment of beach condition, inventory of abandoned structures on beaches, and development of guidance for statewide plans to sustain beaches as the climate changes.

Full implementation of the steps described in this *White Paper*, however, will require new authority and funding from Congress. For example, Congress needs to appropriate funding for state beach plans and for removal of high risk abandoned structures on beaches. Congressional enactment of legislation authorizing and funding these proposed actions would have the further advantage of providing a unified approach to sustaining healthy beaches and promote continuity over the long-term.

The risks posed to the nation's beaches from more severe coastal storms and rising sea level are described below and recommendations for measures to address these risks are described in greater detail.

Problem Statement

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 recreational opportunities for millions of people including swimming, walking, beachcombing, bird-watching, playing, boating, fishing, and sunbathing. Beaches and dunes also provide diverse ecosystem services including rich invertebrate communities and food webs that are prey for birds, nutrient recycling, and habitat for diverse wildlife. 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 increased impacts from climate change." Much of this tourism is associated with beaches which are estimated to contribute $225 billion annually to the United States economy as a result of over an estimated 2 billion beach visits per year by over 200 million Americans. Some states are likely to be 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 $3 billion annually.

Coastal Storms

Coastal storms pose a major risk of erosion to beaches, harm to 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, erosion and increased rainfall. Research indicates that intense storms are slowing down and thus raining on a given place for longer. Even as storms move more slowly, they intensifying more rapidly, making their landfall harder to predict and more likely to result in major damage and loss of life.

Sea Level Rise

Sea level rise around the globe is likely to be 3 to 4 feet by 2100 but may be as high as 6 to 8 feet if efforts to control emissions of greenhouse gases falter. Sea level rise along parts of the American coast will be as much as 30 percent greater than the global average due to factors such as ocean currents and land subsidence. In the short term, this will result in more "sunny day flooding" during high tides and larger surges and greater flooding during storms. In the long term, sea level rise will lead to permanent inundation of significant portions of the American coast.

Impacts of Climate Change on Beaches

The roughly 5,000 miles of beaches along the saltwater coast, estuaries, and the Great Lakes are at risk of erosion and related damages to habitat and wildlife caused by storms. Over the coming decades, rising sea level 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 or structures) beaches will be lost to inundation and become open water.

There is no national comprehensive 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, however, have projected beach loss for specific coastal regions. For example, the U.S. Geological Survey estimates loss of 31-67 precent of California beaches by 2100. In North Carolina, 14 of 17 beaches are expected to have eroded all the way to the road by 2080. The State of Florida reported that "critically eroded" beaches increased from 217 miles in 1989 to 419 miles in 2019 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 the increasing loss of beaches by government and coastal property owners will also influence the future health of beaches.

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.

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. 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 include "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. Still, living shorelines are designed to lock the shoreline in place and will also limit landward migration of a beach.

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. Accelerating sea level rise and more severe storms are likely to prompt an acceleration of these projects, further limiting landward migration of beaches. 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.

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 short-term solutions. 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 "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 mostly due to a combination of human caused impacts.

RECOMMENDATIONS

To sustain healthy beaches as the climate changes, **the country should advance a comprehensive program to assess climate change threats to beaches, develop and implement effective response plans, and invest in meeting related needs, such as the removal of abandoned structures on beaches**. Once beach plans are developed and approved, the federal government should provide funds to implement the plans and to make sure its investment and permit decisions are consistent with these plans.

The Biden administration should begin implementation of these measures now where there is existing authority and funding. Congress should support this effort by considering and adopting legislation to provide authority and funding needed to implement a comprehensive approach to sustaining the nation's beaches over the long-term.

Key elements of a comprehensive program for sustaining beaches are described below.

1. **Assess Beach Health:** The federal government should assess the current condition of beaches and evaluate potential for the landward migration as storms erode beaches and sea level pushes the shoreline landward.

The U.S. Geological Survey, in cooperation with the National Oceanic and Atmospheric Administration (NOAA) and the Army Corps of Engineers, should work together to develop the beach assessment within three years. As part of the assessment, the agencies should work with state and local governments to:

- identify and describe the physical and ecological characteristics of beaches, describe their location along the outer shoreline or within estuaries, and identify the potential "blue carbon" sequestration value;

- describe the recreational uses of beach, including estimation of use by the public and identification of areas operating as public parks or recreation areas;

- identify beaches owned by the federal government, or determined by the Director to be of national significance based on recreational, ecological, or defense considerations;

- identify beaches associated with disadvantaged communities as defined by Interim Guidance for the Justice40 Initiative described in Executive Order 14008;

- for each beach, identify and map adjacent uplands, or other land areas, that beaches or dunes are likely to migrate to as sea level rises to levels of one foot, two feet, three feet, and four feet above current sea level, along with man-made structures that pose obstacles to such landward migration and physical features where adjustments to slope and elevation have the potential to facilitate landward migration.

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. Statewide beach plans should build on the national assessment of beach health and should:

   - identify actions to increase public understanding of the risks that more severe storms and rising seas pose to beaches, among other compounding risks;

   - describe policies and programs to provide a pathway for the landward migration of beaches and dunes including acquisition of real estate and associated property located on beaches and adjacent uplands, removal of man-made obstacles to landward migration, and adjustments to slope and elevation of beaches and adjacent uplands;

   - identify policies and programs for short-term stabilization of beaches, such as use of vegetation and related living shoreline techniques and sand management;

- identify specific beaches that have priority for a more detailed “future beach” plan;

- describe measures to engage disadvantaged communities, as defined by Justice40 Interim Guidance, and to assure that the interests of these communities are considered in the implementation of the plan;

- describe measures to coordinate the plan with related plans (e.g., a plan approved under the Coastal Zone Management Act, the National Estuary Program, and related state or local plans); and

- describe measures to coordinate the plan with the permit decisions under state or federal law, including issuance of permits for coastal protection structures under section 404 of the Federal Water Pollution Control Act.

NOAA should provide guidance for statewide plans and work with state and local governments to understand and address in a timely way the hard choices that arise in drafting statewide plans. For example, the time horizon for statewide plans is a key consideration as a short time horizon is likely to focus the plan on past risk, such as storm flooding, rather than permanent inundation coming later from rising seas.

In addition, states will rely on federal funding to implement plans but need good information about the amount of funds likely to be available to make decisions about implementation of response actions. This information about likely resource constraints can inform judgements about whether to invest in multiple, short-term measures (e.g., protection structures) or more permanent, one-time measures (e.g., structure relocation).

Another difficult decision is setting priorities for development of more detailed beach plans. A key criterion for setting priorities should be potential for successful landward migration. Other factors might include recreational use of a beach and ecological services provided by the beach.

NOAA guidance for statewide beach plans should also address engagement of disadvantaged communities. Beyond simply engaging such communities, states need to develop plans that fairly address their interests and needs, including development of more detailed “future beach” plans for beaches associated with disadvantaged communities.

States should submit statewide beach management plans to the NOAA Administrator for review and approval. NOAA should approve plans that are

consistent with its guidance. In any state with an approved plan, no federal agency should implement a major project, or make a grant for a major project, occurring within or directly affecting beaches within the state unless the state certifies that the grant or project is consistent with the plan.

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.

   Key elements of "future beach" plans should include description of:

   - the location and physical characteristics of the beach, including its location along the outer shoreline or within an estuary;

   - recreational, ecological, and economic values of the beach;

   - ecosystem services provided by the beach, including "blue carbon" sequestration potential;

   - risks posed to the beach system by more severe storms and rising sea level, including timing of such risks;

   - processes for engagement of disadvantaged communities;

   - management strategies, actions, and schedules to facilitate the landward migration of the beach including acquisition of real estate and associated property located on beaches and adjacent uplands, removal of man-made obstacles to landward migration, and adjustments to slope and elevation of beaches and adjacent uplands to facilitate landward migration; and

   - management strategies, actions, and schedules for short-term stabilization of the beach system, such as use of vegetation and related living shoreline techniques and sand management, including consideration of the ecological impacts of such measures and the availability of resources such as sand.

   State and local governments face hard choices in deciding whether to focus just on short term risks associated with storm flooding or to also account for the inundation by rising seas. Investments in short-term stabilization measures may be needed

multiple times whereas strategies to facilitate landward migration, including relocation of structures, are one-time investments.

The Administrator of NOAA should provide guidance on the development of "future beach" plans and approve plans that are consistent with the guidance.

When federal funds will be used to pay for implementation of a "future beach" plan, the federal government should set criteria to guide its decisions on allocating funds as the need for funding is likely to exceed available funds. Allocation criteria should include:

- address the most urgent risks;
- make prudent use of federal funds; and
- address the needs and circumstances of disadvantaged communities.

A "prudent use" of federal funds should be defined as an investment in measures that are expected to provide long-term benefits, that apply broadly to the benefit of recreational, ecological, economic values of beaches, and that reflect assessment of expected changes in conditions, including more severe storms and rising sea level, to at least the year 2100.

The Administration and Congress should direct federal agencies that own nationally significant beaches (i.e., beaches identified as nationally significant in the national beach assessment described in recommendation #1 above) should establish a schedule for development of "future beach" plans on a priority basis and develop and implement plans as expeditiously as possible.

4. **Make Federal Investments Consistent with Plans:** As states develop plans for healthy beaches, it is critical that federal investments and permit decisions be consistent with the plans.

   Beach legislation should require that federal agencies considering projects or major investments occurring within or directly affecting a beach with an approved "future beach" plan should be required to obtain a certification from the state that the project or investment is consistent with the plan as well as the statewide plan.

   Federal permit decisions should also be consistent with "future beach" plans. Specifically, beach legislation should require that no federal permit under section 404 of the Clean Water Act be issued for coastal armoring or other activity within a beach system covered by an approved "future beach" plan unless the state that submitted the plan has certified that the permit is consistent with the plan. In

addition, any such permits should be issued on an individual basis rather than as general permits.

Issuance of flood insurance policies by the Federal Emergency Management Agency (FEMA) should also be consistent with "future beach" plans. Specifically, after approval of a plan, FEMA should not issue new flood insurance policies for property on the beach for which construction or substantial renovation is initiated after the date of approval of the plan, unless the approved plan modifies such a prohibition.

In addition, beginning on the date that is ten years after the date of enactment of the proposed beach legislation, no federal department or agency may implement a major project, or make a grant for a major project, occurring within or directly affecting a beach unless NOAA has approved a "future beach" plan for the beach. This requirement should be subject to waiver in case of a major disaster or national emergency.

Finally, beach legislation should provide that federal disaster spending may be used to remove structures, roads, or supporting utilities from beaches, but beginning on the date that is ten years after the date of enactment of beach legislation, such expenditures may not be used to replace or restore such structures, roads or utilities unless replacement or restoration is authorized in an approved "future beach" plan.

5. **Identify and Remove Abandoned Structures:** Rising sea levels will gradually force the removal of utilities such as electric power, sewer, and water from homes and other structures on beaches. Over time, many of these structures will be abandoned to high water and pose a risk to public safety and navigation.

   The Army Corps of Engineers should maintain an inventory of these abandoned structures and a priority ranking for removal considering degree of risk to public safety and navigation. Based on this inventory and assessment of future needs, the Corps should request funding from Congress for removal projects. Removal projects should be fully federally funded but states should have the option to propose to provide 50 percent cost share for removal of structures ahead of the priority schedule.

   In conducting this program, the Corps should consult with the Environmental Protection Agency concerning management of hazardous materials, consider any "future beach" plan developed by a state, and consider any historically significant features of a structure. Structures should be removed on a schedule that accounts for the cost-effectiveness of removal of multiple structure at one time.

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 "future beach" plans for high priority beaches, and for removal of abandoned structures.

   Authorizations for appropriations should include "such sums as may be necessary" to the Department of Interior for national assessment of beaches.

   NOAA should be authorized to spend $150 million per year to make grants to states for development and implementation of statewide beach plans and for development of "future beach" plans for specific beaches.

   Given the Army Corps of Engineer's history of infrastructure management and the capacity of its regional offices, the Corps should manage funding for implementation of "future beach" plans in the amount of $300 million per year. The Corps should also be authorized to spend $150 million annually to implement a program to inventory and remove abandoned structures on beaches.

The *Coastal Flood Resilience Project* is a coalition of organizations working for stronger programs to prepare for coastal storm flooding and rising sea level in the United States. The views expressed in this *White Paper* are those of the supporters listed below and do not represent the views or endorsements of their organizations.

Supporters of this *White Paper* include:

- Jean Flemma; Urban Ocean Lab
- Rich Innes, Association of National Estuary Programs
- Jeffrey Peterson; author of *A New Coast: Strategies for Responding to Devastating Storms and Rising Seas* and former Deputy Associate Director for Water, White House Council on Environmental Quality
- Susan Ruffo; United Nations Foundation and former Associate Director for Climate Preparedness and Resilience, White House Council on Environmental Quality
- Jason Scorse; Middlebury Center for the Blue Economy
- Stefanie Sekich-Quinn; Surfrider Foundation
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