

Coastal Flood Resilience Project

WHITE PAPER

Strengthening Army Corps of Engineers Coastal and Inland Flood Resilience Projects 11.6.2022

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. This White Paper offers national policymakers in Congress and the Biden administration recommendations for strengthening coastal and inland flood resilience project planning and implementation by the United States Army Corps of Engineers.

Introduction

A changing climate is resulting in increased rainfall and flooding in some regions of the county and more severe storm surge flooding of coastal communities. Storm surges are already riding on top of higher sea levels and reaching farther inland than ever before. This temporary coastal storm flooding will be followed in many places by permanent inundation due to steadily rising sea levels.

Federal, state, and local governments are taking diverse approaches to planning for future flooding and rising seas. Some local governments have developed local response plans. Some states are addressing the problem through their Coastal Zone Management Plans. Other communities are using updates to Hazard Mitigation Plans to outline their response strategies.

The United States Army Corps of Engineers (Corps) works with communities across the country to develop flood resilience plans. An attractive feature of the Corps' process is that approved project plans are eligible for federal funds for project implementation. Some of these projects address coastal areas where flood risks include both temporary high water due to storm surges and permanent inundation due to rising sea levels. Already approved Corps flood resilience plans provide for federal spending of tens of billions of dollars, and dozens of plans for additional plans and projects are under development.

The existing Corps flood resilience planning process has significant drawbacks, including project identification, assessment of alternatives project designs, and consideration of sea level rise inundation risks, and needs to be strengthened to better address these risks. **This paper proposes a new approach to development of Corps flood resilience projects to address these drawbacks.**

Key goals of this new approach are:

- a more comprehensive and science-based approach to selecting flood resilience planning projects and funding project implementation;
- improved development of project designs, including better recognition of sea level rise as an existential, long-term risk to coastal communities;
- more strategic, cost-effective use of federal funds to address flood risks including limited use of interim measures with high operation and maintenance costs (e.g., structural measures) and greater emphasis on more permanent solutions (e.g., relocation);
- expanded use of nature-based solutions and coordination of community flood resilience strategies with strategies for protection of ecosystems (e.g., wetlands and beaches);
- improved consideration of social justice in project selection and planning; and
- stronger coordination in project planning among federal, state, and local agencies.

Some key elements of a strengthened process for Corps flood resilience projects include:

- 1. Require Risk and Need Based Selection of Flood Resilience Planning Study Areas:** focus scarce funding for planning and implementation investments on places with the greatest flood risk and need;
- 2. Expedite Development of Regulations Implementing the P&R and Guidelines to Improve Project Design:** promptly develop Corps regulations to implement the Principles and Requirements for Water Resources Planning for Corps projects, including reforms to improve project selection and design;
- 3. Significantly Improve Cost-Benefit Analysis Methods:** amend current law and revise methods for developing cost-benefit analysis to better represent people rather than property, address social justice, account for environmental impacts as a project cost and environmental benefits as a project benefit, and improve transparency of data to support decision-making;
- 4. Adopt Supplemental Planning Guidelines for Sea Level Rise Resilience Projects:** recognize that sea level rise poses unique flood risks and develop supplemental planning guidelines to account for these risks including use of federal consensus models to project future sea level rise, longer planning periods, greater attention to permanent solutions (such as relocation) and justification of interim measures;

5. **Require Risk- and Need-Based Selection of Approved Flood Projects for Implementation Funding:** consider relative risk and need in setting priorities for funding to implement flood resilience projects; and
6. **Expand Agency Coordination:** adopt new requirements that the Corps' development of flood resilience plans and projects include coordination with other Federal agencies, with state agencies, and with jurisdictions neighboring the project study area or that could be affected by the project.

A one-page summary of these general recommendations and more specific supporting recommendations is provided in Attachment 1.

This White Paper provides background information on the risks that increasing rainfall, more severe coastal storms, and rising sea level pose for Americans and describes the measures that Congress and the Biden Administration should adopt to strengthen the Corp's flood resilience planning and project implementation process to address these risks. Some of these recommendations are drawn from a major 2014 report by the National Academy of Sciences titled [Addressing Coastal Risk on the East and Gulf Coasts](#). This White Paper supplements recommendations provided in a related white paper addressing [needed changes to the Water Resources Development Act](#) and more a more general coastal resilience [policy agenda](#).

Problem Statement: More Rainfall, More Severe Coastal Storms, and Rising Seas

Inland and coastal flooding has been a challenging problem in the United States for centuries. In recent decades, however, a changing climate has ramped up flood risks by driving more annual average and extreme event rainfall, intensifying coastal storm surges, and gradually rising sea levels.

More Extreme Precipitation and Flooding: The 2018 US [National Climate Assessment](#) (NCA) reported that "Annual precipitation since the beginning of the last century has increased across most of the northern and eastern United States and decreased across much of the southern and western United States. Over the coming century, significant increases are projected in winter and spring over the Northern Great Plains, the Upper Midwest, and the Northeast." Rainfall is projected to [increase by 20%](#) in some areas by 2070-2090. Consequently, "the [frequency of floods](#) associated with heavy precipitation events is expected to increase. This includes urban floods, where relatively large areas of impermeable surfaces increase the volume of runoff, and flash floods that occur in relatively steep or small watersheds." Flooding occurring in inland watersheds can move downstream to cause flooding in coastal areas, especially in conjunction with coastal storms.

More Severe Coastal Storms: Coastal communities have long faced significant risks from coastal storm surge flooding, but climate change heightens these storm risks and adds the new threat of permanent inundation by steadily rising sea level.

Coastal storms are a major risk to life and property and major storms can deliver [storms surges of over fifteen feet](#). 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. Research indicates that intense storms are [slowing down and thus](#) raining on a given place for longer, generating more rainfall and flooding. Even as storms move more slowly, they [intensify more rapidly](#), making their landfall harder to predict and more likely to result in major damage and loss of life. Some storms deliver intense precipitation to inland areas that then [comes downstream to worsen coastal flooding](#).

Steadily Rising Sea Level: The National Oceanic and Atmospheric Administration (NOAA) recently issued [new estimates](#) of future sea level rise, concluding that the rate of sea level rise along the American coasts is accelerating and is likely to rise as much over the next 30 years (i.e., about 1.3 feet by 2050 in the “Intermediate” scenario) as it has over the last 100 years. Sea level rise averaging as high as 1.7 feet around the coastline is possible over this period and could reach as high as 2.2 feet in some places (e.g., in the Western Gulf of Mexico).

By the year 2100, NOAA projects sea level rise along the American coasts to average about 4 feet (in the “Intermediate” scenario) while an average increase of over 7.2 feet is possible. Sea level rise in some regions could be higher. By 2150, NOAA forecasts average sea level rise of over 7 feet in the “Intermediate” scenario with the possibility of average increases as high as 12.8 feet and increases in the Western Gulf of Mexico of 14.7 feet.

NOAA explains in its new report that the rate of increase of sea level rise depends on increases in global air temperature driven by the release of greenhouse gases. Additionally, the rapid deterioration of ice sheets in [Antarctica](#) and [Greenland](#) could result in higher projected increases occurring sooner than previously expected. These changes in ice sheets are difficult to model but are thought to pose the greatest risk in the decades after 2050. Finally, sea level will continue to rise for centuries after 2150, due to temperature and melting trends already underway.

Impacts of More Severe Rainfall, Coastal Storms, and Rising Seas: More extreme rainfall, severe storms, and rising seas will bring economic, environmental, and social disruption to coastal communities on an unprecedented scale.

In the case of inland flooding, increased rainfall and extreme rain events are [projected](#) to increase the annual cost of flooding by 26% over the next three decades. Much of this impact is expected to fall on minority and disadvantaged communities. Aging water and power infrastructure and population growth in flood risk areas make managing climate change driven flooding in inland areas more difficult.

In the short term, coastal communities can expect more [“sunny day flooding”](#) during high tides, larger surges, and greater flooding during storms. As sea levels rise, sunny day flooding will increase and gradually lead to permanent inundation. In the longer-term, all or parts of [hundreds of coastal communities](#) will face far more extensive flooding than they currently experience. Storm surges and rising sea levels are also forcing coastal ecosystems to migrate inland and posing a risk to infrastructure assets.

The combination of more severe storms and rising seas is costly to the country. NOAA [identified](#) 332 disasters of all types with costs of over \$1 billion each since 1980 and found that coastal hurricanes resulted in just over half of all the costs (i.e., \$1.1 trillion and over \$21 billion per event). Storms and rising seas are projected to result in future losses of coastal property running into [trillions of dollars](#). These loss estimates, however, are based on the existing population along the coast and are likely to rise as new development occurs in risky coastal places in response to population increases.

Many low-income and disadvantaged coastal communities are among those [in harm’s way](#). These communities are [disproportionately affected](#) by climate change including sea level rise and extreme coastal weather events, and often lack the resources to respond to these risks.

Recommendations for Strengthening the Army Corps of Engineers Coastal Flood Resilience Planning Process

With an annual budget of over \$8 billion, the Army Corps of Engineers manages a diverse set of programs ranging from navigation projects (about \$3 billion) flood resilience (about \$1.5 billion, most of which is for inland projects), and about \$0.5 billion for aquatic ecosystem restoration.

The flood resilience program includes funding for both project studies and project implementation and construction. There is, however, currently a significant backlog of approved projects (i.e., approved flood, navigation, and environmental restoration projects are valued at about \$96 billion) not yet receiving implementation funding. The Infrastructure Investment and Jobs Act (IIJA) provided a major boost to implementation funding of just over \$17 billion, including about \$2.5 billion for inland flood projects and \$2.5 billion for coastal projects. The Corps also receives appropriations from disaster relief bills for inland and coastal flood projects (about \$3 billion in FY 2022).

Today, the Corps’ flood response effort does not reliably deliver the right projects to the right places. As flooding becomes more damaging and sea level rises, societal damages and government disaster relief costs will increase. Flood resilience projects will become more and more expensive. Delivering the right flood and sea level rise response projects to the right places will become increasingly critical.

Taken as a whole, the recommendations in this White Paper are intended to better focus Corps funding for planning and implementation of major flood and sea level rise response projects on places with the greatest risks and need. Selection of places for Corps planning and project implementation also needs to be better integrated other federal agencies and stakeholders and be less siloed within the Corps and the Office of Management and Budget (OMB).

In addition, the projects designed for these high priority places need to better address long-term risks as well as social and environmental impacts and benefits. Traditional consideration of just the monetizable benefits vs. costs of project alternatives and selection of the alternative with the biggest benefit to cost ratio results in misguided decisions that undervalue social and environmental impacts and fail to reflect a changing climate. Methods for assessment of costs and benefits of alternatives need to be improved to better integrate nonmonetizable factors and benefit-cost ratios need to be less a supreme arbiter in selection of project design alternatives and more one of several factors.

Six major reforms are needed to strengthen the Corps' inland and coastal flood resilience planning processes:

- 1) Require Risk- and Need-Based Selection of Flood Resilience Planning Study Areas;
- 2) Expedite Development of Regulations Implementing the P&R and Guidelines to Improve Project Design;
- 3) Significantly Improve Cost-Benefit Analysis Methods;
- 4) Adopt Supplemental Planning Guidelines for Sea Level Rise Resilience Projects;
- 5) Require Risk- and Need-Based Selection of Approved Flood Projects for Implementation Funding; and
- 6) Expand Agency Coordination.

Each of these major reforms is described below along with specific supporting recommendations.

1. Require Risk- and Need-Based Selection of Flood Damage Reduction Planning Study Areas

The Corps' flood damage reduction planning process begins with a local government proposing to work with the Corps to develop a flood plan, usually sharing costs on a 50/50 basis. The Corps reviews and revises the proposal and generally includes it in an annual list of projects to be authorized for funding by Congress, usually as part of the biennial Water Resources Development Act. When Congress authorizes funding for the study, and then appropriates funding in a separate appropriations bill, work begins on the plan.

There are several problems with this process.

- **Lack of Comprehensive Assessment of Flood Planning Needs:** Because study proposals are initiated by local sponsors, Corps investment in flood damage reduction is allocated to study areas without comprehensive consideration of relative need or the opportunity to address the most significant risks. Proposals are forwarded to Congress based on completeness of applications rather than relative risk. Other federal or state agencies considering projects that might be affected by a Corps project have limited opportunity to comment.
- **Flood “Damage Reduction” vs “Resilience”:** A related issue is that current authority for flood “damage reduction” focuses on avoiding loss of structures and infrastructure. Flood risk assessment should be conceived more broadly to include flood impacts on people and communities as well as ecosystems, such as wetlands, marshes, and beaches.
- **Political Approval Process:** Congress needs to authorize each planning study and then appropriate needed funds. This process inherently favors local sponsors that happen to have Congressional representation on appropriate Congressional committees and opens the door for lobbying by those local sponsors that have the financial capacity to fund such lobbying. Recent expansion of the use of “earmarks” may play a role in funding of studies and projects. Disadvantaged communities often have more limited access to Congress than wealthy communities.
- **Local Cost Share Favors Wealthy Communities:** The requirement that local sponsors provide half the costs of the planning study can discourage communities with limited resources from applying for a planning study because they may be unsure of being able to provide the needed local funds. Lower income communities often include significant minority populations that have faced historical discrimination. The high local cost share tends to limit applications from disadvantaged communities and improves the chances of applications from wealthy communities being selected.

**National Academy of Sciences
Recommendation**

“Given the enormous and rising cost of coastal disasters within the United States, improved system-wide coastal risk management is needed. Under the current planning framework, the USACE responds to requests at a local level on a project-by-project basis but has no authority to initiate a comprehensive national analysis of coastal risk and strategies to address them, unless specifically requested and funded by Congress. A national perspective is needed to achieve the most benefits from federal investments and provide regional solutions, rather than piecemeal, project-by-project approaches.”

[*Reducing Coastal Risk on the East and Gulf Coasts*](#); National Academy of Sciences; 2014

To address these issues, the process for selection of project study areas should be reformed with the following measures:

A. Publish Periodic National Flood Resilience Risk and Needs Assessment:

As a key first step toward focusing federal flood investments in the places with the greatest risk and need, **the Corps should periodically conduct a comprehensive national assessment of flood and sea level rise risk to communities and develop objective measures of flood risk due to both storms and rising seas.** The Corps should also develop measures to describe the potential for localized loss of life and property as a result of coastal and inland flooding and the financial need for funding assistance. This assessment should be framed based on the broad concept of flood resilience, rather than simply preventing flood damage.

**National Academy of Sciences
Recommendation**

“The federal government should work with states to develop a national coastal risk assessment. The geographic patterns of disaster risk represented by human fatalities, economic losses, and social impacts can illustrate where the risks are greatest and in need of targeted risk reduction interventions. This analysis should not merely be based on the recent history of hazards but on a comprehensive assessment of risk, including multiple types of hazards under current and anticipated future conditions.”

[*Reducing Coastal Risk on the East and Gulf Coasts*](#); National Academy of Sciences; 2014

The existing FEMA [Riverine Flood Risk Index](#) and the [Coastal Flood Risk Index](#) provide a starting point for this assessment, although the coastal index does not address sea level rise risk and neither index considers financial need or social justice. NOAA data sources, such as the [Sea Level Rise Viewer](#) and the [Coastal Flood Exposure Mapper](#) also can support coastal flood risk assessment. An assessment should be developed in consultation with the existing interagency Water Resources Council (see Recommendation #6), should be an ongoing process rather than a one-time report, and should be supported with a budget line item. The Corps has conducted similar projects, including the [North Atlantic Coast Comprehensive Study Report](#). The existing [clean water](#) and [drinking water](#) needs assessments are models for this work.

Although several models are available to begin assessment of flood risk, assessment of relative need is a more complicated challenge. Factors commonly included in a needs assessment include income level of persons benefitting from a project, financial capacity of the local jurisdiction, high density of primary as opposed to second homes, as well as social justice factors, including past discrimination based on race or other factors. Integrating risk assessment with needs assessment to form a single priority ranking is also important but challenging. The Corps should work with diverse communities and organizations to develop widely supported risk and needs assessment methods, including the advisory committee recommended in #6.B below.

B. Assist Selected Communities in Applying for Flood Resilience Planning Study: Given the challenges that many communities face in seeking federal assistance to address flood and sea level rise risk, **the Corps should annually offer to provide technical assistance to specific local communities, groups of local communities, or tribes to support development of flood resilience planning study applications.** Such offers should be made after consultation with other federal agencies and in coordination with the state or states in which the communities are located. The existing Corps Silver Jackets program, which includes diverse federal agencies, is a good model for this initial planning consultation and assistance and could be tasked with this work.

In inviting communities to apply for assistance with developing an application for a Corps flood resilience planning study, and in selecting applications to be funded, the Corps should consider the national flood resilience risk and financial need assessment (see Recommendation #1), including the estimated loss of life and property to be minimized and the expected savings to the federal government in terms of flood insurance and disaster relief spending.

The Corps should also consider social justice benefits of a planning study and resulting project, including benefits to low-income communities and communities that have faced historical discrimination. In evaluating the social justice aspects of a planning study, the Corps should consider [Social Vulnerability Index \(SoVI\)](#) scores for communities. Consistent with the administration's [Justice40 Initiative](#), the Corps should work toward the goal of 40% of planning studies being for disadvantaged communities.

In addition to specific communities invited to apply for technical assistance in developing a planning study, other communities should be able to apply for a study. In the event that only some communities offered technical assistance choose to apply for a planning study, or applications from invited communities are incomplete, the Corps should be authorized to accept and consider applications from communities not originally invited to apply.

C. Set Local Sponsor Planning Study Cost Share Based on Financial Capacity: The local sponsor cost share for a planning study is 50% of the project costs, provided that up to 25% of the local share can be in the form of non-cash, in-kind contributions. The cost of planning studies, however, can run to millions of dollars and wealthy communities are more likely to be able to finance both cash and in-kind contributions over a multi-year period.

Although the Corps now has authority to consider “ability to pay”, it is rarely used and is not well-supported by guidance. **The Corps should actively consider the financial capacity of an applicant and adjust the local cost share based on ability to pay.** A

wealthy community (i.e., where the median household income is above the national average) should be asked to make a full cash contribution of 50% of the study costs.

Communities with lower median household incomes should be asked to contribute a lower cost share in proportion to their median household income, provided that local cost shares should be waived for communities with median household income in the lowest 10% of communities. The Corps should also consider other measures of community financial capability, including bond rating and ratio of debt to revenue.

D. Expand Federal and State Government Participation in Planning Study Selection:

Federal and state agencies implement a range of programs and projects along the coast and have an interest in the selection of projects for Corps flood resilience planning.

Enhanced cooperation among these agencies will help avoid conflicting approaches and misallocation of limited funds. Recommendation #6.A of this white paper describes steps to improve coordination among agencies.

E. Fund Flood Risk Planning Studies on a Priority Basis: Congress and the Administration should agree to create a budget line item specifically for flood resilience planning studies, rather than including funding or studies within the much larger line item for both studies and project implementation. Based on the applications for flood risk studies that are complete and ready to proceed, **the Corps should propose an annual funding level for these studies based on estimated federal costs for inclusion in the President's Budget.**

In the event that the cost of pending approved planning studies exceeds the amount the Congress appropriates for this work, the Corps should fund planning studies on a priority basis considering the assessment of risk and need to the extent appropriations allow.

2. Expedite Development of Regulations Implementing the P&R and Take Other Steps to Improve Project Design

Today, planning and design for most water resources projects implemented by federal agencies is carried out under the [“Principles and Requirements”](#) (P&R) for such projects updated in 2014 and supported by more detailed “guidelines”. Federal agencies generally have developed regulations that implement the P&R and the guidelines for that agency.

The Corps, however, is a major exception to this process. For many years, Congress used appropriations bill language to prevent the Corps from implementing an updated P&R or supporting guidelines. This obstacle has recently been removed and the Corps has begun the

[process of developing regulations to implement the P&R and guidelines](#). In the interim, the Corps is following the existing planning guidance and guidance in this [memorandum](#).

- A. Promptly Promulgate Regulations Implementing the P&R and Guidelines:** A first, critical step is for the Corps to expedite proposal and final promulgation of regulations implementing the P&R and guidelines. The [Federal Register Notice](#) on this process asked for input by August 2, 2022 but does not provide an estimated date for a proposed rule or final promulgation. This process often takes several years and is subject to administrative and political delays. **In the interest of prompt action and improved water resources decision-making, the Corps should commit to promulgation of final regulations prior to the end of 2024.**
- B. Use Authority in P&R to Improve Water Resources Decision-making:** Why is implementation of the new P&R and guidelines so important for development of flood resilience project designs? The Corps process to develop regulations to implement the P&R and guidelines is an opportunity, but not an obligation, to focus its planning on development of an improved range of project alternatives and address several issues with current procedures and policies. **The Corps should capitalize on the opportunity to make full use of the authority in the P&R to improve decision-making.**

Some key changes to Corps procedures and policies that the Corps should adopt in new regulations implementing the new P&R and guidelines are described below.

- **More Comprehensive Assessment of Project Design Alternatives:** Adopting updated procedures under the P&R can result in better-defined project alternatives and selection of better designed projects because the ratio of monetized costs to benefits can be balanced by other factors.

Under the old P&G planning guidance, now in effect only for the Corps, the Corps is to select the project that “reasonably maximizes net economic benefits consistent with protecting the nation’s environment.” This policy commonly results in selection of the project design that is found by a cost-benefit analysis to have the highest benefit to cost ratio (BCR). The new [P&R explains](#):

“Heretofore, Federal investments in water resources have been mostly based on economic performance assessments which largely focus on maximizing net economic development gains and typically involve an unduly narrow benefit-cost comparison of the monetized effects. Non-monetized and unquantified effects are often included in the overall analysis process, but are not necessarily weighted as heavily or considered key drivers in the final decision making process. As a result, decision making processes are, at this point in time,

unnecessarily biased towards those economic effects that are generally more easily quantified and monetized.”

The P&R, however, goes on to note:

“It is recognized that most of the activities pursued by the Federal government will require an assessment of tradeoffs by decision makers and that in many cases the final decision **will require judgment that considers the extent of both monetized and nonmonetized effects.**” (emphasis added)

So, as the Corps proceeds to develop P&R implementing regulations, it can work to both improve methods for monetizing factors that may be undervalued (see Recommendation #3 below) and to apply its judgement to account for factors that can't be monetized. By using this discretion, the Corps can move away from a strict consideration of a benefit-to-cost ratio as a sole arbiter of project alternative ranking and can shift to a process that considers the cost-effectiveness of alternatives along with other factors (e.g., projected future climate change, social justice, and environmental benefits and costs).

- **Better Consideration of Future Conditions:** The P&R notes the importance of accounting for future conditions, including climate change and urban development, even though they may be uncertain.

“From specification of existing problems and opportunities to the formulation, evaluation and selection of plans, projected accelerating changes in aquatic systems and sea level resulting from a changing climate should inform the understanding of water resource needs and how these needs can be realistically addressed.”

- **Better Consideration of Non-Structural (Natural, Relocation, and Buyout) Alternatives:** The use of nonstructural measures, including natural and nature-based

**National Academy of Sciences
Recommendation**

“...additional focused efforts and stronger incentives (or disincentives for inaction) are necessary to improve the quality of these plans and the breadth of nonstructural mitigation strategies considered. For example, the federal government could adjust USACE cost sharing for coastal risk reduction projects according to the extent and quality of hazard mitigation planning and the degree to which mitigation is incorporated into other local planning efforts (e.g., land use, transportation, critical infrastructure). The potential for strategic incentives to improve development decisions or facilitate retreat should be carefully examined in the context of long-term cost savings.”

[*Reducing Coastal Risk on the East and Gulf Coasts*](#); National Academy of Sciences; 2014

measures and relocation of assets or buyout of property, “can often be the most cost effective and environmentally protective alternative to implement.” The P&R goes on to note that: “Full consideration and reporting on nonstructural alternative actions or plans should be an integral part in the evaluation of Federal investments in water resources.” A nonstructural option, and the environmentally preferable option, are to be included in the final alternatives. Nonstructural alternatives are also more likely than alternatives to enhance public access to water resources and provide more diverse and sustainable recreational opportunities.

- **New Consideration of Social and Environmental Justice:** As the Corps implements the new P&R, it will be making a commitment to environmental and social justice. The P&R provides:

“Agencies should ensure that Federal actions identify any disproportionately high and adverse public safety, human health, or environmental burdens of projects on minority, Tribal, and low-income populations. In implementing the Principles, Requirements and Guidelines, agencies should seek solutions that would eliminate or avoid disproportionate adverse effects on these communities.”

- C. Adjust Local Sponsor Share for Project Implementation by Type of Project:** Although water resources projects are governed by the P&R, the federal government has a financial interest and policy interest in making prudent, long-term investments. For example, relocation of structures and use of other nonstructural or nature-based approaches are often the best long-term investment. Because many of the benefits from these projects are difficult to monetize (see Recommendation #3), they may be rejected in favor of a structural measure. Local preference for a project alternative is a consideration, but because all alternatives require the same 35% local share, local sponsors do not consider their costs to be a major factor in their alternative preference when total cost of alternatives is roughly comparable.

Relocation is an especially useful strategy in the context of coastal flooding and permanent sea level rise. More information on the tradeoffs between relocation and protection strategies is provided in a [CFRP white paper](#) on the topic and in Recommendation #4.D of this paper.

The Congress and Administration should adjust local cost share for project implementation to provide a lower local cost share for implementation of some types of projects, such as relocation and non-structural and nature-based measures (e.g., 15%) and higher local share for structural alternatives (e.g., 50%). Cost share adjustments should also account for the quality of local coastal flood planning.

D. Implement the Federal Flood Risk Management Standard: The Federal Flood Risk Management Standard (FFRMS) provides that federal investments be located outside of existing and future flood and sea level rise risk areas whenever possible. When location of a structure in a flood risk area can't be avoided, structures are to be protected to a level that is two feet above the base flood elevation or three feet above base flood elevation in the case of critical facilities.

The P&R was written prior to the FFRMS, so it does not specifically require FFRMS implementation in the case of flood resilience projects. Nothing in the FFRMS, however, exempts water resources projects and **the Corps should include in proposed regulations implementing the P&R, or in other guidance, measures to apply the FFRMS to flood resilience plans and projects.**

3. Significantly Improve Cost-Benefit Analysis Methods

Despite all the improvements it makes in the planning process, [the P&R](#) still provides that economic analysis of costs and benefits plays a role in selecting among project alternatives: "Any recommendation for Federal investments in water resources to address identified water resources needs must be justified by the public benefits when compared to costs." (Note that, for most federal agencies, cost-benefit analysis must comply with OMB Circular A-94. Corps analyses of water resources projects, however, are exempt from A-94 requirements and must comply with the P&G (or P&R/guidelines) and related regulations.)

Some key needed improvements to cost-benefit methods are described below. Some of these improvements can be accomplished through changes in Corps planning guidance and regulations, while other changes require amendments to federal law.

A. Improve Monetary Estimates of Loss of Life in Cost Benefit Analysis: In 2017, the Corps revised its planning guidance to provide that flood risk management studies include a quantitative assessment of loss of life for each alternative when it is a "significant factor." In a 2019 [report](#) the Government Accountability Office (GAO) concluded that this revision "should allow the Corps to provide decision makers and stakeholders with more precise information about the relative magnitude of these effects in future economic analyses."

But, GAO concluded:

"Although Corps guidance now requires quantification of loss of life effects when significant, it does not require monetization of those effects. As a result, the quantified loss of life effects will not be fully comparable with the monetized benefit and cost effects used to evaluate alternatives..."

GAO also noted:

“Project alternatives that reduce the risk of flooding or that relocate people from the flood plain may lower the risk that individuals living or working in a flood plain will drown or become injured during flood events.”

A 2014 [National Academy of Sciences study](#) on coastal storm flooding indicated that the practice of quantifying and valuing reductions in loss of life is widespread in the federal government, allowing these risk reductions to be included in the economic analysis.

The Corps should provide for analysis of loss of life without a finding that it is a “significant factor,” and monetize these impacts to allow them to be considered in cost-benefit analysis. Loss of life calculations should treat each life as of equal value and not adjust calculations based on factors such as earning potential.

- B. Estimate Benefits Based on People Served Rather than Value of Property Protected:** A common element of an assessment of project benefits is the value of property planned to be protected by the project. This approach tends to recognize higher benefits in wealthy areas than in less wealthy areas and lead to funding of projects in these areas.

A better approach to defining project benefits is to identify the number of people benefitting from a project rather than the value of the property they own. **The Corps should review recent literature in this area, develop methods to monetize benefits based on the number of people served, and use the methods to calculate and monetize benefits individually and collectively.**

This approach would involve valuing flood resilience benefits that are widely shared human experiences, including avoided injuries, continuity of employment, community, and family relationships, and avoided social and psychological stress (see recent [research](#)). Applied across the full span of project assessments, this method will tend to reduce high ratios of benefits to costs for high-value property with small populations and increase ratios for lower-value property with larger populations.

- C. Cite Flood Damages Avoided as Benefits for All Non-structural Projects:** The National Academy of Sciences (NAS) published a major [report](#) providing new directions for the Corps in 1999. That report noted the importance of nonstructural approaches to reducing flood damages, “including the permanent evacuation of vulnerable structures from floodplain areas. Relocating residents and structures from frequently flooded low-lying areas permanently avoids flood damages and (expensive) disaster assistance payments.”

The NAS commented that:

“In such programs, the benefits of flood damages avoided should be explicitly accounted for in calculating project benefits. However, the P&G do not allow for the benefits of primary flood damages avoided to be claimed as benefits in all nonstructural projects. The committee recommends that the benefits of flood damages avoided be included in the benefit-cost analysis of all flood damage reduction projects—including all nonstructural projects—and that these benefits be calculated in a uniform and consistent fashion.”

In its development of guidelines to implement the new P&R and guidelines, the Corps should revise its cost-benefit analysis methods to account for flood damages avoided for all non-structural projects.

- D. Improve Transparency Regarding Cost-Benefit Error Bounds:** In its [report](#) evaluating the Corps flood resilience planning program, GAO identified a need to improve transparency with respect to the significant uncertainty associated with cost-benefit numbers and the ratio of cost to benefits. GAO noted that cost-benefit analysis often was presented as specific numbers and a single ratio that did not reflect the range of uncertainty with respect to both costs and benefits. GAO reported that the error bounds for cost-benefit numbers can be over 20-30%, and that presentation of specific numbers suggested a degree of accuracy and reliability that did not exist.

In response to the GAO report, the Corps agreed to work to improve transparency of the uncertainty related to cost-benefit assessments. The Corps should carry this work forward into development of P&R implementing regulations.

- E. Improve Economic Evaluation of Nature-Based Solutions:** The GAO released a [report](#) in 2019 pointing to two key challenges to the increased use of nature-based solutions to flood risks: lack of information on performance of nature-based solutions and difficulty in monetizing the costs and benefits of nature-based approaches.

In the case of improving information on performance of nature-based practices, the GAO noted that the Corps was working to develop more detailed information. In 2021, the Corps released [new guidelines](#) for including nature-based approaches in flood risk projects. The guidelines, developed as part of an international collaboration, are not official Corps policy, but provide the technical support that the Corps will need to judge the performance of potential nature-based solutions and help overcome reluctance to include nature-based elements in projects.

The Corps has begun the process of building this new understanding of natural-based solutions into the planning process. A new Corps Engineering with Nature program is focusing on this challenge and a July 2022 [Corps report](#) reviewed issues and challenges in this area, concluding:

“The evolution of USACE’s mission, authorities, and available valuation methodologies have aligned such that significant changes in how water resource projects are evaluated could occur in the near-term.”

The report notes that its implementation of the new P&R and guidelines removes a “legal” obstacle to promoting nature-based solutions, and that the new international guidelines remove another “technical” obstacle to incorporating nature-based solutions.

A significant remaining issue is the “lack of clear and consistent guidance on economic evaluation of NBS [nature-based solutions], including methods for quantifying and monetizing benefits” (e.g., wildlife habitat, cleaner water, improved recreational amenities). The report notes:

“In the absence of consistent guidance and methods for monetized valuation, planners noted that including alternatives with NBS can add to the cost side of the BCA calculation without fully accounting for the corresponding benefits, leading to arbitrarily low BCRs.”

The Corps report notes that “the science surrounding the quantification of environmental and social benefits has advanced in recent years...” but it does not describe specific efforts by the Corps to evaluate improved options for monetizing nature-based solutions or to integrate new practices into project planning and analysis.

The Corps needs to acknowledge the need for more affirmative action in this area and develop a workplan to systematically identify and improve monetization of co-benefits of nature-based solutions and develop methods to monetize these benefits.

This work should include improved assessment and monetization of the ecosystem impacts of other project alternatives and practices. The Corps is [currently working](#) with the Water Institute of the Gulf on [a project](#) to address some of these questions.

Some improvements to cost-benefit analysis will require changes to federal law.

- F. Adopt a 0-2 Percent Discount Rate for Flood Resilience Projects:** It is standard practice in cost-benefit analysis to discount the value of a future investment to reflect the idea that a dollar today is worth more than a dollar in the future. The Office of Management and Budget addresses cost-benefit analysis in Circular A-94 and provides for a 7%

discount rate. But water resources project analysis is exempt from Circular A-94. Since 1974, the discount rate for water resources projects has been set by a formula established in the Water Resources Development Act of 1974 that considers the interest rate payable on Treasury securities. The current water resources discount rate is 2.25% but is likely to increase in coming years.

Economists debate the most appropriate discount rate for cost benefit analysis, with some arguing for higher rates and others calling for zero or negative discount rates. Using a higher discount rate reduces the value of the future stream of benefits or costs compared with a lower or zero rate. Therefore, a higher discount rate implies that benefits are less valuable the further they are in the future.

To address this problem, Congress should apply a discount rate in cost-benefit analysis of flood resilience projects of 0-2%. This approach recognizes a “social discount rate” (i.e., a method of calculating the present value of costs and benefits that will occur at a later date that reflects society’s willingness to spend money now for benefits that will occur in the future). A recent [survey of economists](#) found “a surprising degree of consensus among experts, with more than three-quarters finding the median risk-free SDR of 2 percent acceptable.” Although the current discount rate set by formula in statute is now just above 2%, recent inflationary changes are likely to drive increases in this rate.

In the case of coastal flood resilience projects addressing the long-term impacts of steadily rising sea level, a lower or zero discount rate should be adopted. These coastal projects need longer planning horizons (see Recommendation #4.C). Analysis of competing project designs over long planning horizons using a zero discount rate recognizes the “long tail” benefits of projects and avoids the discounting that would lower the dollar value of benefits in the future. Using a zero discount rate would mean that the long-term benefits of a project would not be reduced by the discount rate. When comparing the relative costs and benefits of a long-term project and a short-term project, a higher discount rate presents higher-value benefits for the short-term project while the long-term project presents lower-value benefits as a result of discounting.

FEMA Revised Cost-Benefit Methods

In October 2022, FEMA announced an “alternative cost-effectiveness methodology” for cost-benefit analysis of proposed flood projects.

Under FEMA’s new policy, a flood mitigation project may be considered cost-effective if, “when using the 7% discount rate, the BCR [benefit-cost ratio] is at least 0.75 or greater, and if at the 3% discount rate the BCR is at least 1.0 or greater, and the mitigation activity benefits disadvantaged communities, addresses climate change impacts, has hard to quantify benefits, and/or is subject to higher costs due to the use of low carbon building materials or compliance with the Federal Flood Risk Management Standard.”

G. Use Real, Rather than Nominal, Dollars in Cost Benefit Analysis: The Congressional Research Service (CRS) has [evaluated](#) Corps use of cost-benefit analysis and concluded:

“The current discount rate policy for federal water projects contains a significant inconsistency. The Corps’ governing documents guide it to calculate benefits and costs in real dollars, but to use a nominal discount rate. Generally, a real discount rate is used to discount real dollars, or a nominal discount rate is used to discount nominal dollars. Either combination will result in the same present value and benefit cost ratio. On the other hand, mixing real and nominal figures, as the Corps does, will alter present value calculations and the benefit-cost ratio.”

CRS concluded that:

“Given the temporal distribution of benefits and costs for many Corps projects (i.e., near-term costs and long-term benefits), this practice reduces the number of long-term projects that pass the benefit-cost ratio test.”

To address this problem, Congress should remove the requirement in the Water Resources Development Act of 1974 that requires the use of nominal dollars and ensure consistency in the use of real values across all cost-benefit analyses.

4. Adopt Supplemental Planning Guidelines for Sea Level Rise Resilience Projects

In addition to the improvements to the project design and alternative selection process that will result from implementation of the P&R and guidelines and improved cost-benefit analysis, the Corps should adopt several changes to project design guidance for coastal projects to better address the risks posed by rising sea levels.

Supplemental planning guidance for sea level rise is needed for several reasons.

- Sea level rise brings permanent inundation, unlike rainfall flooding that drains away to leave dry ground allowing for rebuilding.
- Sea level rise is occurring everywhere along the coast, unlike extreme rainfall resulting in flooding that occurs in specific places.
- NOAA has predicted the likely increase in sea level rise all along the coast to the year 2150, unlike increased rainfall flooding, which is not as clearly projected.

- The projected acceleration in the rate of sea level rise, combined with the dense population and physical assets in areas at risk of inundation by rising seas, will result in increasing damages and demand for flood response.

The challenges related to responding to rising sea levels need to be accounted for in Corps flood project design guidelines and the alternative selection process. Some key adjustments needed to account for rising sea are described below.

- A. Apply Consensus-based Federal Sea Level Rise Projections and Scenarios:** The [sea level rise scenarios published](#) by NOAA are the result of a consensus interagency process. In the past, the Corps has developed its own sea level rise estimates that were different from those of other federal agencies. The Corps should commit to supporting the interagency process for future coastal flood planning and using the federal government wide sea level rise scenarios that will be used by other agencies.

The sea level rise scenarios described by NOAA provide a range of projections based on different assumptions about the rate and extent of the warming of air due to climate change. NOAA advises that higher sea level rise scenarios be applied to projects or areas where high-value assets or public safety are involved. For example, FEMA has adopted the Intermediate High Scenario as a default planning scenario for communities. **The Corps should adopt the Intermediate High Scenario as a default planning scenario or justify why another scenario is adopted.**

- B. Fully Consider Future Sea Level Rise:** Under current law, the Corps is directed to develop coastal flood resilience plans to address storm-related flooding. As part of this work, the Corps considers the extent to which future rising sea levels make storm surge flooding more extensive or higher. If requested to do so by the local sponsor, the Corps can also consider the permanent inundation expected to result from gradually rising sea levels even in the absence of a storm.

Unfortunately, there are several incentives for local sponsors to avoid full consideration of rising sea levels. If the local sponsor requests that such analysis be conducted, the cost of any supplemental work (i.e., work beyond what would be done absent full consideration of rising seas) is borne entirely by the local sponsor. In addition, consideration of impacts due to permanent inundation by rising seas, rather than just higher storm surges, could lower the benefit/cost ratio, reducing the chance of project approval.

Full consideration of sea level rise, however, is critical to an honest and full assessment of coastal flood risks and to selection of a project design that fits the problem. For example, a risk assessment that focused only on flooding from storms surges, might

reasonably propose to spend money to elevate structures to prevent damage from temporary flooding during occasional storm events. Consideration of permanent inundation from rising seas, however, would suggest that elevated buildings in permanent standing water would be impractical from the point of view of access and municipal services. As sea level rises, another, new investment in another project design (e.g., relocation) would be needed.

The best solution to this issue is for Congress to revise the Water Resources Development Act to remove the requirement for a local sponsor to request the full sea level rise analysis, and to include the costs of that analysis along with other shared costs. Lacking a change to the law, the Corps should give lower priority to funding of projects that do not fully consider sea level rise (see Recommendation #5.A).

- C. Extend Planning Period for Coastal Flood Resilience Projects to 2150:** Under existing Corps planning guidance, the time horizon for flood resilience studies is fifty years. **In the case of coastal flood and sea level rise resilience planning studies and projects, a project planning period to the year 2150 is more appropriate and should be adopted.**

A consideration in support of the 2150 planning period for coastal studies and projects is that NOAA has projected future sea level rise all along the US coastline to the year 2150 and will continue to update these projections periodically in the years to come. In addition, NOAA expects sea level to rise for many years after 2150 and beyond regardless of reductions in emissions of greenhouse gases under the Paris Climate Accord.

Given the confidence that sea levels will continue to rise for many years, plans developed based on a much shorter planning period are likely to overlook the continuing steady rise in sea levels and the resulting permanent inundation of coastal land areas. As noted above, a failure to fully recognize sea level rise risk in project plans can lead to mistaken assessment of costs and benefits and inappropriate project design. In the same way, a failure to anticipate continuing sea level rise over the long term can result in poor project design.

For example, a project that anticipates future storm surges and sea level rise over a fifty-year period might lead to selection of a small seawall as the project design, on the grounds that a seawall high enough to avoid permanent inundation for fifty years can be built for a cost that is less than the projected benefits. But by anticipating continuing sea level rise, and the eventual overtopping of the initial seawall, the costs of a higher seawall might be found to be greater than the benefits. This would prompt the Corps to look for a project design where long-term benefits are more likely to exceed costs, such as relocation.

An important factor in this assessment is the need to account for the increased costs of operating and maintaining structures subject to sea level rise over the long-term and the costs of decommissioning a structure when it is made obsolete by rising seas. Current cost-benefit assessment commonly assumes fixed costs for operation of structures over time. Because sea levels will continue to rise for many years, the costs of operating and maintaining structures built to address rising seas are likely to increase each year adding to costs.

Further, sea level will eventually overtop most structures, and there may be costs relating to removal or decommissioning of the structures, and these costs need to be addressed in a cost-benefit assessment. Operating and maintenance costs as well as decommissioning costs are fully paid by local sponsors.

**National Academy of Sciences
Recommendation**

“Given the long-term challenge of coastal risk reduction in the context of increasing sea-level rise, the typical 50-year USACE planning horizon appears too short to support sound coastal risk management....Unless long-term sea-level rise is considered in all aspects of project planning, coastal risk reduction projects might be selected that spur near-term development and increase long-term exposure to flooding, ultimately increasing overall coastal risks. A planning horizon of 100 years would allow decision makers to consider the adaptability and long-term costs and benefits (including social and environmental effects) of coastal risk reduction alternatives in the context of various sea-level rise projections.”

[*Reducing Coastal Risk on the East and Gulf Coasts*](#); National Academy of Sciences; 2014

- D. Promote Selection of Nonstructural and Relocation Measures:** Relentless sea level rise for decades and centuries to come will eventually force most coastal communities to move to higher ground. **The Corps should clearly recognize the reality of a changing climate and develop guidelines for nonstructural options, including relocation of assets at risk or buyout of property to minimize the future losses to inundation by rising seas.**

The Corps has established a [National Nonstructural Committee](#) that promotes the use of a range of nonstructural options including wet- and dry-proofing buildings, elevating buildings, buyouts of structures, and relocation of buildings. Although the Committee has published a range of materials, most address options such as wet- and dry-proofing buildings and elevation. There is presently very limited Corps guidance on how to design a coastal flood resilience program based on buyouts/acquisition or relocation.

The Corps should address nonstructural measures, especially buyouts and relocation, in new regulations to implement the P&R and guidelines. Key topics should include:

- what specific nonstructural measures will be covered by Corps implementation funding once a project is approved;
- how to administer and fund project designs that call for gradual implementation of projects over long periods (e.g., 10-20 years);
- how these projects will be coordinated with related programs of other federal agencies, such as FEMA buyout programs; and
- how to estimate the costs of buyouts and relocation in cost-benefit analysis.

The Corps' [current practice](#) with respect to property acquisition is to offer fair market value subject to some negotiation. The approach, however, can result in inflated project costs because fair market value is hard to estimate, and because a current fair market value of a property in a sea level rise risk area is likely to steadily decrease over time. This can result in buyout-related alternatives appearing to be costly in relation to other alternatives.

A better approach to estimating costs of a buyout-focused project is to provide that a purchase price will be the lower of fair market price or a price that is in the federal government's financial interest. A price that is in the federal government's financial interest is not more than what the government is likely to pay absent a purchase, including the \$250,000 full loss payment under the National Flood Insurance Program, the likely costs of future disaster relief, and any federal tax loss due to a claim for a catastrophic property loss. A [related approach](#) has been proposed in California.

In addition, the Corps should withdraw or revise its current [policy](#) requiring that any plans providing for buyouts of at risk property include a commitment from the local government sponsor to use eminent domain authority in cases where owners decline to accept a proposed buyout. The Corps argues that this is necessary to assure the "completeness" of the plan and avoid "checkerboard" holdouts not protected by the plan.

A likely impact of this eminent domain policy, however, is to discourage local sponsors from selecting buyout and relocation approaches for flood resilience plans. The Corps should lower its expectations with respect to the necessity of completeness in a buyout or relocation project design and also develop alternatives to move buyout and relocation projects forward without a mandate for use of eminent domain, including "life rights" allowing current owners to remain until they die.

A related consideration is that buyout and relocation measures can be implemented over time (e.g., an initial round of buyouts for the most vulnerable structures can be followed by second or third rounds that are timed in response to the increasing risk over

the project planning period). A phased buyout program avoids high upfront costs and can be adjusted based on real world conditions. **The Corps should work with Congress to develop funding mechanisms that allow buyout and relocation strategies to be financed over time (e.g., create a budget account that holds obligated funds for second and third round funding and distributes it as needed over several decades).**

Finally, **Congress and the Administration should adopt local cost shares for relocation and nonstructural alternatives that are lower than the cost share for structural projects (see Recommendation #2.B) and support relocation within a community where possible.**

- E. Require Justification of Interim Solutions:** By recognizing sea level rise as a long-term risk and promoting long-term solution like relocation, the Corps and local sponsors will be faced with a need to consider when it is reasonable to implement a project design that is clearly an interim solution (e.g., an affordable seawall that will have limited use) and when a project designed for the longer-term impacts would be a more appropriate use of local sponsor and federal funds.

Depending on the circumstances of local geography and relative sea level rise, an interim, short-term project design might be justified as a stopgap measure. **Faced with a decision of whether to select an interim project design or a longer-term design, local sponsors and the federal government need to justify the use of interim solutions** and consider several factors:

- The cost in today's dollars of an interim solution is likely to be less than the cost of implementing a longer-term design. This is attractive in that it places less financial burden on the local sponsor and allows limited federal funds to support projects in more places.
- Implementing a longer-term design may cost more than an interim solution, but the true cost of addressing the problem over the long term includes the combined cost of the interim measure and a second project to implement the longer-term solution. This amounts to paying twice to solve the same problem.
- A key factor in this analysis is the discount rate applied to the money spent in the future, rather than today, to implement the long-term solution. A low or zero discount rate might suggest that the long-term solution is the smarter investment, while a higher discount rate would suggest that the costs of the interim measure will be more than paid back by delaying the higher spending for the longer-term investment.

Corps guidance should address tradeoffs of interim solutions in the context of longer-range approaches in financial terms, and also consider consequences for the local community and the environment. As noted in D above, Congress and the Corps should develop mechanisms for phased financing of projects.

5. Require Risk- and Need-Based Selection of Approved Flood Projects for Implementation Funding

For many years, the Corps' flood risk reduction planning process to address inland and coastal flooding has generated approved projects that were not funded by annual appropriations. Today, the cumulative backlog of approved projects is approaching \$100 billion. As new flood resilience plans are developed and approved, this backlog is certain to grow, despite the funds approved for the flood resilience projects under recent infrastructure legislation.

The backlog of approved and authorized projects effectively forms a pool of projects for which appropriations may be approved under annual appropriations bills. This process starts with the Corps and the Office of Management and Budget including in the President's budget specific project appropriations from the backlog, considering Administration priorities and a "performance criteria" expressed as a benefit to cost ratio, commonly 2.5-1. The benefit to cost ratio is calculated by OMB based on a 7% discount rate, rather than the lower discount rate used by the Corps, and this makes projects in which benefits fall largely in the future harder to justify. Relative risk or need, or whether the project is for inland flooding or coastal flooding, is not explicitly considered. Appropriations committees may revise this list, but with passage of the appropriation bill, the identified projects are funded. Projects from the backlog list might also be funded by a supplemental disaster appropriations bill following a major disaster.

As both inland and coastal flooding become more serious and costly in the years ahead, the current process for funding flood resilience projects will be increasingly inadequate. Some key problems are described below. These problems are similar to those described in Recommendation #1 of this paper concerning setting priorities for initial flood planning.

- **Lack of Inland and Coastal Flood Needs Assessment:** There is presently no comprehensive national assessment of the need for inland and coastal flood planning and project implementation. Such an assessment would consider backlogged projects but also identify potential flood risk today and in the future, taking changing conditions such as climate change and development into consideration. The use of a high benefit to cost ratio and a 7% discount rate tends to discourage recommendation to Congress to fund projects with future benefits addressing climate change.

- **Uncertain Quality of Older Backlog Projects:** Some projects making up the backlog were approved many years ago under old design criteria. Although some of the projects may address high risks and needs, the project design may need to be updated and adjusted and new information (e.g., impacts on ecosystems and sea level rise projections) more fully considered.
- **Lack of Coordination Between Flood Planning and Implementation:** The current process suffers from a lack of coordination between the pace of planning studies and the pace of project implementation, resulting in a large backlog of projects, lag times between planning and implementation that deliver project designs based on outdated data, use of limited planning funds for projects that do not get implemented, and disappointment among project sponsors that approved projects take many years to be funded.
- **Delays of Projects for Disadvantaged Communities:** Current practices for planning area selection and definition of project cost-benefit ratios tend to favor wealthy communities. Changes to these practices will allow disadvantaged communities to compete with wealthy communities, but working down the current backlog will require many years as other projects are funded in their turn.
- **Local Cost Share Favors Wealthy Communities:** Once a Corps flood project is approved, it may be many years before federal funding is available, over which financial conditions may have changed. Once offered, the federal funding typically requires a 35% local match for construction. A wealthy community may be able to bond for the local match at a reasonable interest rate. Lower income communities may find that it is impossible or difficult to issue a bond at a reasonable interest rate, and may have to decline the federal funding. Lower income communities often include significant minority populations that have faced historical discrimination.

To address these issues, Congress and the administration should adopt several changes to the process for funding inland and coastal flood resilience projects.

- A. Fund Flood Resilience Projects on a Priority and Needs Basis:** Congress and the Administration should agree to create a budget line item for flood resilience project implementation, distinct from a line item for flood resilience planning studies. From the approved flood planning studies that are ready for implementation, the Corps should propose an annual funding level for implementation of these studies based on estimated federal costs to be included in the President's Budget.

In the likely event that the cost of implementing pending approved projects exceeds the amount Congress appropriates for this work, the Corps should fund projects on a

priority basis considering a national assessment of risk and need (see Recommendation 1.A) to the extent appropriations allow. In determining priority for project implementation, the Corps should consider the relative risk that a community faces from flooding, including the estimated loss of life and property to be minimized and the expected savings to the federal government in terms of flood insurance and disaster relief spending. The benefit to cost ratio developed to help guide selection among alternative project designs, should not be used in this ranking and project proposal stage.

As projects are proposed for funding on a risk and need basis, any project proceeding toward implementation drawn from the backlog of project designs approved prior to the Corps' implementation of the P&R and guidelines should be reviewed to identify any "red flag" issues and to correct these issues by updating and amending the project design. Any project approved more than twenty years prior ago should be removed from the backlog list and go through the updated planning study and approval process prior to funding, if appropriate.

The Corps should also consider social justice benefits in project priority rankings, including benefits to low-income communities and communities that have faced historical discrimination. In evaluating the social justice aspects of a project, the Corps should consider [Social Vulnerability Index \(SoVI\)](#) scores for communities. Consistent with the administration's [Justice40 Initiative](#), the Corps should work toward the goal of 40% of planning studies being for disadvantaged communities.

If Congress retains the existing statutory option for a local sponsor to decline to have the Corps include a complete evaluation of sea level rise as part of a coastal planning project, the Corps should consider the risk assessment incomplete and lower the funding priority for the project accordingly.

- B. Set Local Sponsor Flood Project Implementation Cost Share Based on Financial Capacity:** The local sponsor cost share for flood plan implementation is 35% of project costs. The cost of projects, however, can run to tens of millions of dollars and wealthy communities are more likely to be able to finance these costs.

The Corps should consider the financial capacity of an applicant and adjust the local cost share based on ability to pay. A wealthy community (i.e., where the median household income is above the national average) should be asked to pay a local cost share of 50% of the project construction costs. Communities with lower median household incomes should be asked to contribute a lower cost share in proportion to their median household income, provided that local cost shares should be waived for communities with median household income in the lowest 10% of communities. The

Corps should also consider other measures of community financial capability, including bond rating and ratio of debt to revenue.

6. Expand Federal Agency Coordination

As a changing climate drives increasing flood risks -- more extreme precipitation, more severe coastal storms, and rising sea levels -- the federal government will face steadily increasing demand for resources to plan and implement measures to reduce these risks.

In addition to the reforms already described in this white paper, the current system of identifying, designing, and funding federal projects for inland and coastal flood and sea level rise resilience provides for insufficient coordination among federal agencies and state and local governments and with diverse other interested parties.

In order for the federal government to effectively respond to flood resilience needs, new initiatives are needed to expand coordination among federal agencies on flood resilience and to strengthen cooperation among the federal government and state, tribal, and local governments as well as stakeholders. Two key measures that the Biden Administration should implement to improve coordination among all parties involved in improving flood resilience are described below.

A. Create Inland and Coastal Interagency Flood Resilience Committee: Although the flood resilience projects managed by the Corps play an important role in building flood resilience, other federal agencies also implement important flood related programs.

Some examples include:

- FEMA manages disaster prevention and response and manages key programs., such as the Building Resilient Infrastructure and Communities Program (BRIC), property buyout programs, hazard mitigation planning, and the National Flood Insurance Program;

National Academy of Sciences Recommendation

“Coastal risk management requires a long-term vision, recognition of the wide array of potential benefits, and coordination of efforts that are currently spread across many agencies that sometimes operate under conflicting mandates. Developing and implementing a national vision for coastal risk management is not the responsibility of any single agency alone, but will require federal leadership and extensive collaboration among federal, state, and local agencies.”

[Reducing Coastal Risk on the East and Gulf Coasts](#); National Academy of Sciences: 2014

- NOAA manages the Coastal Zone Management Program that includes coastal flood planning and works with the National Fish and Wildlife Foundation to implement the National Coastal Resilience Fund;
- HUD implements the Community Development Block Grant – Disaster Relief program that supports rebuilding community infrastructure after a disaster;
- EPA works with communities to reduce flood risks to water and wastewater treatment facilities; and
- DOT works with states to assure that major transportation infrastructure assets are resilient to flooding and sea level rise, including implementing the Promoting Resilient Operations for Transformative, Efficient, and Cost-saving Transportation (PROTECT) program.

The President should establish by Executive Order an Inland and Coastal Flood Resilience Committee under the existing Water Resources Council to serve as a federal focal point for management of policy, programs, and funding of inland and coastal flood response, including response to rising sea levels. Federal agencies participating in the Committee should include the CEQ, OMB, the Corps, NOAA, FEMA, EPA, HUD, DOT, NASA, DOD, USDA, and other agencies. Key functions of the Committee should include:

- 1. Oversight of Flood Risk Needs Assessment:** The Committee should oversee the development by the Corps of a national assessment for flood risk and the need for flood projects.
- 2. Review Federal Flood Resilience Planning Initiatives:** In its development and selection of places for flood resilience planning projects, the Corps should consult with other federal agencies, especially FEMA, and build partnerships to leverage the diverse capacities of other federal agencies to support projects (e.g., the [Interagency Coastal Wetlands Working Group](#)).
- 3. Review Major Project Designs:** In the case of major flood resilience project designs projected to involve federal spending greater than \$1 billion, the Corps should consult with other federal agencies and the affected state with respect to the design alternatives, potential implications for assets or resources of concern to other agencies, and opportunities to improve the social justice aspects of a project. Major flood projects for communities should also be coordinated with efforts to address flood risks to infrastructure and ecosystems. These major projects should only be approved with the concurrence of the Water Resources Council.

4. **Flood Resilience Budget Crosscut:** The Committee, in cooperation with OMB, should annually develop a crosscut within the President’s Budget describing funding for programs related to flood resilience.
5. **Biennial Report to the President:** The Committee should submit to the President biennially a public report summarizing the work of the Committee, providing an assessment of the operational effectiveness of federal flood resilience programs, including progress in addressing social justice aspects of flooding, and making any recommendations for administrative or legislative actions to strengthen response to inland and coastal flooding, including sea level rise.

B. Create an Inland and Coastal Flood Resilience Advisory Committee

State and tribal governments are critical to the success of any national effort to strengthen response to inland and coastal flood risk. Nonprofit organizations and businesses also have resources and perspectives that can provide valuable input to the federal government as it designs and implements flood resilience responses.

President Biden should use the Federal Advisory Committee Act to establish by executive order a Flood Resilience Federal Advisory Committee. The Committee should include diverse representatives of state, tribal, and local government, nonprofit organizations, and the private sector.

In addition to providing advice and guidance to the federal flood resilience committee, the advisory committee should provide comments on reports to Congress and the President, including any dissenting views.

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 contributors listed below and do not represent the views or endorsements of their organizations.

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Attachment 1

Recommendations to Strengthen Army Corps of Engineers Coastal Flood Resilience Project Planning

- 1. Require Risk- and Need-Based Selection of Flood Resilience Planning Study Areas**
 - A. Publish Periodic National Flood Resilience Risk and Needs Assessment
 - B. Assist Selected Communities in Applying for Flood Resilience Planning Study
 - C. Set Local Sponsor Planning Study Cost Share Based on Financial Capacity
 - D. Expand Federal and State Government Participation in Planning Study Selection
 - E. Fund Flood Resilience Planning Studies on a Priority Basis

- 2. Expedite Development of Regulations Implementing the P&R and Take Other Steps to Improve Project Design**
 - A. Promptly Promulgate Regulations Implementing the P&R and Guidelines
 - B. Use Authority in P&R to Improve Water Resources Decision-making
 - C. Adjust Local Sponsor Share for Project Implementation by Type of Project
 - D. Implement the Federal Flood Risk Management Standard

- 3. Significantly Improve Cost-Benefit Analysis Methods**
 - A. Include Monetary Estimates of Loss of Life in Cost-Benefit Analysis
 - B. Estimate Benefits Based on People Served Rather than Value of Property Protected
 - C. Cite Flood Damages Avoided as Benefits for All Non-structural Projects
 - D. Improve Transparency Regarding Cost-Benefit Error Bounds
 - E. Improve Economic Evaluation of Nature-Based Solutions
 - F. Adopt a 0-2 Percent Discount Rate for Flood Resilience Projects
 - G. Use Real, Rather than Nominal, Dollars in Cost-Benefit Analysis

- 4. Adopt Supplemental Planning Guidelines for Sea Level Rise Resilience Projects**
 - A. Apply Consensus-based Federal Sea Level Rise Projections and Scenarios
 - B. Fully Consider Future Sea Level Rise
 - C. Extend Planning Period for Coastal Flood Resilience Projects to 2150
 - D. Promote Selection of Nonstructural and Relocation Measures
 - E. Require Justification of Interim Solutions

- 5. Require Risk- and Need-Based Selection of Approved Projects for Implementation Funding**
 - A. Fund Flood Resilience Projects on a Priority Basis
 - B. Set Local Sponsor Flood Project Implementation Cost Share Based on Financial Capacity

- 6. Expand Federal Agency Coordination**
 - A. Create Inland and Coastal Flood Resilience Interagency Committee
 - B. Create an Inland and Coastal Flood Resilience Advisory Committee