I. Project Information*

Project Director	David Johnson
Project Title	Incorporating Equity and Social Vulnerability into the Design of Flood Risk Mitigation Strategies
Project Location	multiple communities in Louisiana
Project Summary	We propose to leverage publicly available data and models from major planning efforts in Louisiana to enable local and regional planning authorities to apply an equity lens to the design and evaluation of nonstructural flood risk mitigation strategies (e.g., elevating houses in place, floodproofing, voluntary acquisitions and managed retreat). We will develop an analysis workflow and decision support system (DSS) that enables exploration of how a nonstructural program's design and performance would vary depending on the characterization and strength of decision-maker preferences for equity and social vulnerability versus economic benefit (e.g., reduction in average annual losses and flood insurance premiums). We will convene a scoping workshop with local/regional planners, residents, and other stakeholders to identify decision-relevant measures of the impacts nonstructural risk mitigation strategies would have on equity, social vulnerability, resilience, and economic risk. A multi-objective optimization algorithm will identify efficient strategies for allocating a user-specified budget in a manner consistent with any set of relative preferences for the outcome measures, and the prospective outcomes will be summarized interactive visualizations of the results that not only show the attributes and performance of a particular strategy, but that also compare and aggregate across strategies to identify actions that are common to strategies founded upon a wide range of preferences. Collaborating partners will provide regular feedback to ensure the DSS provides actionable information.

II. Progress Report Questions

1. Please revisit your proposal and review your goals and the outcomes you were seeking to achieve through this grant. How successful were you in meeting your goals? Please assess your success against the criteria you set in your proposal and use any combination of anecdotes, stories, graphs, charts, visuals as well as data to explain your success. Upload supporting files if you choose.*

We consider the project to be successful, although we did shift some plans to take on additional scope informed by our initial community workshops. The team met our proposed key performance indicators (KPIs) regarding periodic meetings with our advisory board, attendance at community workshops and follow-up engagement (including adding Stephensville as a new community beyond the proposal), and check-ins with CPRA. Unfortunately, due to personnel changes at Louisiana Office of Community Development, we were unable to schedule a final discussion of the decision support system (DSS) with OCD.

In conversations with community members, affordability and insurance impacts were consistently raised as key drivers of decision-making around home elevations and relocation, and access to essential services was also mentioned by many participants as being a major concern, particularly in smaller communities. This led to new areas of inquiry to examine how equitable service provision across coastal Louisiana communities is. Some of the information on these topics has been incorporated into the DSS (https://public.tableau.com/app/profile/it.department8562/viz/NAS_Equity_Dashboard_20240401/TitlePage, with a project introduction at https://thewaterinstitute.org/projects/incorporating-equity-and-social-vulnerability-into-the-design-of-flood-risk-mitigation-strategies), but we have been able to expand our work in these areas subsequent to the project's conclusion.

Specifically, residents were concerned about the potential for essential services (e.g., hospitals, grocery stores, gas stations, EMS and fire stations, etc.) to be damaged and closed during a repair period, or closed permanently due to declining populations. Standard analyses of service accessibility exam the drive-time required to connect local residents to services, but we have expanded the set of metrics to indicate the resilience and redundancy of services. In each of our partner communities, we estimated numerous indicators of how critical each service is, such as the total population closest to a service than any other of the same type, the marginal drive time to the second-closest asset for that population, and the average number of assets accessible to that population within a critical time threshold (e.g., within four minutes for EMS stations). We have analyzed how robust the rankings of how critical an essential service are relative to others in the same community (or coastwide) depending on how much policy makers care about each indicator relative to the others. We also examined how equitable the distributions of service provision are across the urban/rural divide, as well as across different racial and income groups.

Thanks to this project, CPRA is considering how these new indicators could be incorporated into Louisiana's 2029 Coastal Master Plan to measure the equity in infrastructure service outcomes and risks with different flood protection projects in place. In addition to presenting our analyses to our partner communities, we have presented the work in at least six major conferences (including State of the Coast, the National Adaptation Forum, and other meetings with a broader policy and practitioner audience). We expect at least three peer-reviewed papers to ultimately be published based directly on the analysis supported by this project, but it has also led to two proposals

currently under review at NSF and DHS and one small planning grant with PI Johnson funded by Stanford University. St. Mary Excel, one of the local community partners from this project, would continue to be engaged with us if the NSF proposal is funded. Project personnel at The Water Institute are also considering replicating the equity of essential services analysis as part of a funded project in Jacksonville, Florida.

Optional File Upload

2. How has your work benefited your organization, professional field, community, or other stakeholders?*

• The research team previously studied the impacts of nonstructural protection from a purely qualitative perspective using semi-structured interviews. The scenario building methodology developed though this research has allowed us to better identify the cascading effects of both nonstructural action and inaction. Through this process, we were able to identify not only those tipping points beyond which residents will leave their communities, but the various trigger points that lead up to residents making this decision. The data obtained through this process can be used by coastal planners and others to develop action timelines to more effectively mitigate the unintended consequences of nonstructural actions. Convening an advisory committee that included, among others, coastal decision makers and agency representatives involved in planning nonstructural protection efforts has the potential to improve and adaptively manage future nonstructural protection efforts.
• Creation/Development of the resilience dashboard offers customized data visualizations that can support decision-making at a variety of scales (e.g., regional, local, individual, etc.). For example, this tool provides geospatial awareness of critical and essential facilities in communities and drive time to access them. From a planning perspective, this could be useful for planning and/or siting emergency services, resource allocation and distribution centers, transportation, infrastructure, etc.; particularly in communities that have experienced significant population shifts.
• The indicators of equity of essential services access developed by this project may be incorporated directly into Louisiana's 2029 Coastal Master Plan, similar to how PI Johnson previously developed an equity-focused metric of flood risk that was adopted by the 2023 plan.

3. Are there any other successes related more broadly to this project that you would like to share with us?*

• Finding data on the cost of nonstructural flood mitigation, such as home elevation, can be difficult to access for researchers, much less the general public. This information was provided to workshop participants and offered an educational opportunity for better understanding of the logistics that elevation entails.
• The scenario building workshops and subsequent public meetings involved several important stakeholder groups, including mayors and other local government officials, business leaders, regional port directors and real estate professionals. During the presentation of the resilience dashboard, several of these stakeholders noted how the data that was provided to them in the dashboards could help inform some of their decisions.

4. What did you learn (positive or negative) as a result of this grant? What lessons would you share with other organizations or the field at large?*

• The four case study communities were selected in part due to their distinctive geography and demographic profiles. While there were several localized differences identified in the scenario building workshops, each community had similar concerns related to the implementation of nonstructural mitigation project. Most notably, voluntary acquisition (i.e. buyouts) was seen as ultimately being detrimental to each of the communities examine, regardless of whether they are currently growing or shrinking. While residents leaving may experience a combination of positive and negative outcomes, the loss of population and the resultant decrease in tax base and increase in vacant lands in the case study communities would be expected to ultimately result in a loss of community.

• The community conversations and scenario building workshops revealed that the decision to leave a community is generally not the preferred option for most residents. Many have expressed a desire to stay in their communities for as long as they can as well as a willingness to rebuild after disasters and extreme weather events. However, regardless of this desire, the scenario building workshops showed that social and economic conditions might force residents to relocate. In many cases, the decision comes down to the affordability of flood insurance. In other cases, the decision will be driven by loss of community cohesion and the fact that younger residents are leaving for better jobs.

• For some residents, there is a perceived inequity in the distribution of nonstructural protection. For example, some workshop participants noted that more affluent areas are being offered funding to elevate their homes while low income or minority communities are being offered buyouts, even when the level of risk is similar. These concerns have resulted in a lack of trust in governmental agencies to adequately protect all residents, regardless of social status.

• In all the scenarios developed through the scenario building workshops, population loss was shown to trigger a wide range of negative cascading effects on the community. Because a voluntary acquisition program, by definition, results in decreased population in certain areas as an initial condition, this trigger happens much sooner than it would even if no action was taken, potentially moving residents and their communities closer to a tipping point beyond which the community goes into decline.

• Funding nonstructural protection is viewed by many workshop participants as an ineffective use of taxpayer money diverting funds from flood risk reduction measures. It was stated that nonstructural protection will provide a poor return on investment and that these funds would be better spent providing structural protection for communities.

5. How do you characterize your relationship with the GRP and what suggestions do you have for improvement?*

GRP had minimal involvement in the project, but our understanding is that was not the case for all projects funded in this opportunity. We are unsure the scope of GRP's contributions to other projects, though, so it is unclear how this would be improved in future calls.

6. Please provide any other feedback or comments you have for the GRP.*

n/a

7. If applicable, please identify and describe the ways you or your organization leveraged GRP's grant (e.g., other funders, volunteers who worked on the program, in-kind donations etc.) Please specify the value and/or number/hours of volunteers if possible.

- St. Mary Excel – 18 hours (Catherine 6, Monica 12) for Morgan City and Stephensville workshop coordination; another 10 (5 each) for initial scoping meeting/driving us around.
- Slidell/East St. Tammany Habitat for Humanity (Kentrell) – 8 hours per workshop (x2 = 16 total), plus 3 for the initial scoping meeting.
- Cameron Parish: estimated 4 hours for the initial scoping meeting and 12 for workshop coordination since the second workshop was virtual and required less coordination.