

## Developing Location-Based Communication and Public Engagement Strategies to Build Resilient Coastal Communities

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Connecticut Institute for Resilience and Climate Adaptation



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## EXECUTIVE SUMMARY

Coastal communities in Connecticut suffer from chronic flooding and erosion damage due to the effects of severe weather events, storm surge and sea-level rise. To reduce the negative socio-economic consequences wrought by these natural disasters, it is necessary to activate social or human resilience that could enable these communities to efficaciously adapt to and mitigate the flood and erosion outcomes in their natural environment. This project aims to advance our knowledge of the human factors that promote individual and collective actions for building community resilience against the threat of flooding, erosion and sea-level rise. Specifically, the project invited residents from the Town of Fairfield and the City of Bridgeport to share their beliefs, attitudes, intentions and behaviors that may promote their individual and collective efficacy necessary to build a resilient coastal community.

The Town of Fairfield is a suburban community whose residents are relatively homogeneous in terms of their demographic profile. By comparison, the City of Bridgeport is an urban community whose residents are highly diverse in demographic terms. Key findings of this project are highlighted as follows.

- Residents in both communities share similar fear, anxiety, and vulnerability beliefs associated with the flood and erosion risk that they face at the individual and community level.
- Fairfield respondents, relative to those from Bridgeport, appear to feel less efficacious individually and collectively as a community to address their environmental risk via sharing the burdens for risk management between their own community, other CT coastal communities and U.S. taxpayers.
- While just over half of both samples believe that another *Sandy*-like superstorm could arrive in the next hurricane season, Fairfield residents appear to be relatively more risk averse than their Bridgeport counterparts.
- TV stations and cable TV networks that provide weather-forecast related news (online and offline) are the primary sources for receiving flood-risk information, alongside weather-related mobile phone applications. Personal social networks (including family, relatives, friends and neighbors) are likewise considered a popular source for receiving flood-risk information by proportionately more Bridgeport than Fairfield respondents.
- Social media are the least-referenced sources for receiving flood-risk information. The Bridgeport sample is two-to-ten times more likely than the Fairfield sample to report that they receive such information from social media platforms.
- Most respondents from both communities believe that a hypothetical parcel tax policy (independent from property value) will receive support from their own household or property owners at risk in CT's coastal communities. They also believe that a bonding policy will be a more viable funding scheme than a taxing policy. While most Bridgeport respondents support a flat fee for all property owners, most Fairfield respondents favor a prorated fee (weighed by property proximity to a floodplain).

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- A majority of respondents from both communities consider the following information to be important to them: who is in charge of resilience project planning, what these projects are, how much the projects would cost, and whether these projects would affect the residents/community.
- The importance of science in validating the rationale for planning resilience projects is conferred by 79%-87% of the respondents.
- The top-three most effective means for communication engagement mentioned by the Fairfield sample include the use of emails, public meetings and then phone messages. Bridgeport respondents prefer the utilization of inter-neighborhood working groups and public meetings, followed by neighborhood/community design workshops and emails/phone messages.
- Between 26% and 44% of Fairfield respondents are interested in directly engaging the citizen-led *Flood and Control Board* to learn about or participate in resilience planning in their community. At least 46% of respondents wish to keep up with the upcoming resilience planning events and another 25% may be interested in receiving resilience planning resources.
- A vast majority of Bridgeport respondents have expressed interest in directly engaging and participating in resilience planning activities hosted by the *Resilient Bridgeport* project. About an equal number of them also desire to keep up with resilience planning resources and upcoming planning events.

As the concept of community can vary depending on a combination of historical, social, cultural, racial, ethnic, geographic or ideological factors, it could be challenging to establish a community identity that aligns with individual beliefs about environmental conservation and climate change. Hence, an approach that looks to progressively build the social capital needed to achieve that common ground and shared vision could be cultivated. Public engagement and communication strategies are important tools for cultivating social capital among members of a community.

The lessons learned from the current project suggest that the notion of a *resilient community* should be conceptualized as a multidimensional living construct, if the goal is to build and strengthen the capacity, motivation and resolve of community members with different socio-cultural identities to resist the threat and reduce the risk stemming from climate change.

### BACKGROUND<sup>1</sup>

Coastal flooding and erosion stemming from the combined influences of severe weather events, storm surge and sea-level rise has presented serious environmental challenges to Connecticut's coastal communities. Aside from enhancing the physical resilience that could help reduce the structural damage brought by these severe weather events, social or human resilience remains the backbone that drives necessary actions to prevent, mitigate and recover from negative socio-economic consequences in these coastal communities.

While the scientific literature offers a rich body of field evidence, best practices and policy options for flooding and erosion mitigation strategies, our knowledge remains limited about the human factors that reflect individual risk beliefs, attitudes, motivations and behavioral intentions toward developing or applying individual and/or collective efficacy to actively participate in community-based mitigation. This project intends to fill that empirical gap by assessing the human factors facilitating individual and collective community action for building socioeconomic resilience against the threat of flooding, erosion and sea-level rise.

The goals of this project are to:

- 1) Evaluate community resident and stakeholder responses to resilience planning as the basis for developing recommended communication and engagement strategies;
- 2) Recommend tailored communication strategies aimed at motivating community residents and stakeholders to take ownership of community resilience planning; and
- 3) Recommend tailored engagement strategies aimed at empowering community stakeholders to develop social resilience and generate support for community-based resilience planning.

To assess the human factors that influence an individual and a community's motivation to engage in the discourse and planning action related to mitigation projects to build socioeconomic resilience, this project collected focus group data from the residents and stakeholders of the City of Bridgeport and the Town of Fairfield. Specifically, a mixed methods approach – including focus groups and surveys – was adopted for this empirical project.

Participants for the focus groups conducted in each community involved a mix of community residents and stakeholders. Community residents included individuals who reside in the areas that are most impacted by weather-induced flood and erosion. Stakeholders were represented by leaders of community organizations, neighborhood association members, legislative members of the municipal government, resilience planning personnel, mitigation practitioners, and the like.

Respondents for the survey live in the same flood-prone areas where the focus group participants also reside. The survey conducted in each community enabled a large number of residents to consider a set of wide-ranging measures that assess their response to twenty different topics – with flood risk-management planning or resilience building – at the individual, community and institutional level.

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<sup>1</sup> Cover page map. Retrieved from [https://www.fairfieldct.org/filestorage/10736/12067/17055/26401/48808/US\\_Army\\_Corps\\_of\\_Engineers\\_-\\_Coastal\\_Storm\\_Risk\\_Management\\_Study\\_-\\_June\\_2019.pdf](https://www.fairfieldct.org/filestorage/10736/12067/17055/26401/48808/US_Army_Corps_of_Engineers_-_Coastal_Storm_Risk_Management_Study_-_June_2019.pdf)

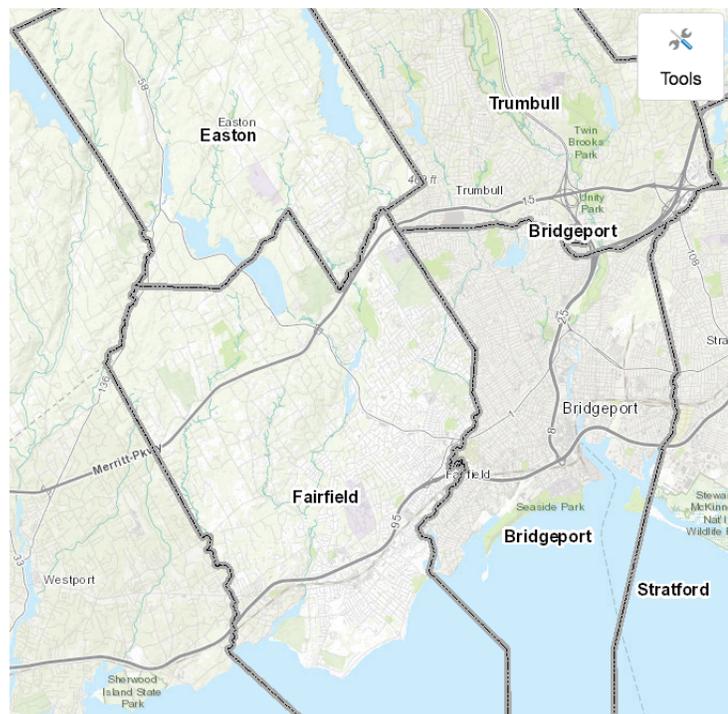
## SECTION 1: PROJECT DESCRIPTION

### 1.1 Project Sites

Fairfield and Bridgeport were chosen as the project sites for several reasons. First, these two communities were both severely impacted by Super-storm Sandy. Second, each of these communities also has serious on-going flooding and erosion problems that require continuing mitigation project planning and implementation. Third, the Town of Fairfield and the City of Bridgeport offer significant demographic differences (Fairfield is a suburb with largely homogeneous population and Bridgeport represents an urban area with greater socioeconomic and racial diversity). Having these two different communities as project sites offers a unique opportunity to discover the potential idiosyncratic responses toward the mitigation challenges faced by each community.

The map (see Figure 1)<sup>2</sup> below depicts the location of the municipalities of Fairfield and Bridgeport in relation to the *Long Island Sound*. This map also shows the rivers located in these two municipalities that flow into the Long Island Sound, which can overflow during a heavy rain fall or storm surge from the coast during a severe weather event. Within each municipality, the areas that are most affected by coastal flooding, erosion and sea-level rise were targeted for assessment and human-subject data collection. A map for each of these areas designated for data collection is provided in conjunction with the findings that will be separately described for each project site in a later section below.

Figure 1  
Map of  
City of Bridgeport  
and Town of Fairfield



<sup>2</sup> Tow of Fairfield GIS, Retrieved from <http://metrocg.mapxpress.net/Fairfield/>.

### 1.2 Project Implementation

Outreach efforts were advanced to reach out and engage neighborhood association organizers, community leaders, municipal officials and relevant mitigation project planning personnel associated with each designated project site. In turn, these community leaders and stakeholders extended their cooperation to advise and support the completion of this project. This cooperation also included dialogues about historic and current adaptation and mitigation strategies, alongside site visits to inspect the locales that are at risk for or have on-going flood and erosion damage.

For the Fairfield project site, cooperation, guidance and/or logistical support was obtained from the Flood and Erosion Control Board, Department of Conservation, Engineering Department and the Office of First Selectman. The Flood & Erosion Control Board and the Office of the First Selectman were instrumental in facilitating sample recruitment and/or implementing the data collection procedure for both focus groups and the survey. Additional consultation service was provided by a mitigation design practitioner and an environmental policy expert. The Town of Fairfield provided Town Hall facilities for conducting the focus groups.

From the Bridgeport site, this project received substantial cooperation and expert consultation from the mitigation planning administrator, project managers, designers and communication professionals associated with the *Resilient Bridgeport Project* as well as grassroots organizations and other community stakeholders. The *Resilient Bridgeport Project's* public engagement division, grassroots organizations and selected community stakeholders assisted this project with sample recruitment and/or implementing the data collection procedure for both the focus groups and survey. The *Resilient Bridgeport Project* provided its facilities for conducting the focus group in the City of Bridgeport.

### 1.3 Data Collection Procedure

Two focus groups were conducted separately for each project site.<sup>3</sup> Data collection for these focus groups was completed in April of 2019. Potential focus group participants were randomly selected from an email list; they were invited to consider whether to participate in the study through an email announcement. Each focus group took about 1½ hours to complete; each participant received a gift card as compensation for their time and effort. To protect participant privacy, no personal identification information was recorded. The anonymized focus group data sets were audio-recorded; data were coded, analyzed and then summarized for reporting below.

A survey was conducted on the Internet for each project site independently.<sup>4</sup> Data collection for these surveys was concluded in July of 2019. The survey was hosted on a cloud-based survey service site and took about an average of 30 minutes to complete. Potential survey respondents were selected from an email list; they were invited to consider whether to participate in the study through an email announcement. Each participant that completed the survey received a gift card as compensation for their time and effort. Personal identification information was not recorded for survey participants to help protect their privacy. The anonymized survey data were downloaded, validated and then analyzed, before they were summarized for reporting below.

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<sup>3</sup> Focus group questions are available via <https://circa.uconn.edu/communications-resilient-coastal-communities/>.

<sup>4</sup> Survey questionnaires are available via <https://circa.uconn.edu/communications-resilient-coastal-communities/>.

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In terms of the email lists utilized by the project to recruit study samples, the sources for these email databases varied between the two project sites. For the Town of Fairfield, the email list was provided by the Flood and Erosion Control Board of the Town who has access to an email database that contains contact information for residents across all 10 districts of the Town. Fairfield residents who participated in the focus groups were not invited to respond to the survey

For the Bridgeport site, the email list originated from the following these sources 1) Bridgeport residents who attended public meetings/design workshops hosted by the *Resilient Bridgeport Project*, 2) Bridgeport stakeholders that are grassroots/community organization leaders and serve on the *Citizen Advisory Committee* for the *Resilient Bridgeport Project*, and 3) the public engagement division employed by the *Resilient Bridgeport Project*. Bridgeport residents who were focus group participants did not receive an invitation to the survey.

### 1.4 Project Findings

Findings from the focus groups and surveys conducted for the two project sites are reported separately below. Focus group findings presented will cover the summary for the participants' answers and discussion in response to a prepared list of discussion questions. This summary will be organized based on the key themes drawn from the focus group narratives.

Survey findings will provide different sets of descriptive statistics associated with participant responses to survey questions that are organized to measure a set of theory- or practice-based concepts. Each set of descriptive statistics presented will be accompanied by a separate discussion that summarizes and interprets the statistical findings.

The report below will present and discuss the focus group findings for the Fairfield site first, followed by the Bridgeport site. Survey findings will be reported in the same order.

## SECTION 2: FAIRFIELD PROJECT FINDINGS

Data collection was conducted in three of the ten voting districts located in the Town of Fairfield (see Figure 2). These ten voting districts make up Representative Town Meeting (RTM) of the Town. The three districts (districts 7, 9 and 10) targeted as the Fairfield region for data collection are the areas that have been most impacted by past flood events; they are also the regions that are most susceptible to the negative consequences of flood, erosion and sea-level rise.

These three districts are highlighted in aqua blue, light blue and brown color, respectively, in Figure 2 below.<sup>5</sup> A hurricane inundation map that indicates the different elevation levels in the areas associated with districts 7, 9 and 10 is shown in Figure 3 below.<sup>6</sup>

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<sup>5</sup> Representative Town Meeting (RTM), Fairfield, CT, Retrieved from <https://www.fairfieldct.org/RTM>.

<sup>6</sup> Fairfield Flood Mitigation Status and Plans (2015, January 8). Fairfield, CT, Retrieved from [https://www.fairfieldct.org/filestorage/10736/12067/17055/26401/48812/Fairfield\\_Flood\\_Mitigation\\_Status\\_and\\_Plans\\_-\\_01-06-2015.pdf](https://www.fairfieldct.org/filestorage/10736/12067/17055/26401/48812/Fairfield_Flood_Mitigation_Status_and_Plans_-_01-06-2015.pdf)

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Figure 2  
District Map of  
Town of Fairfield

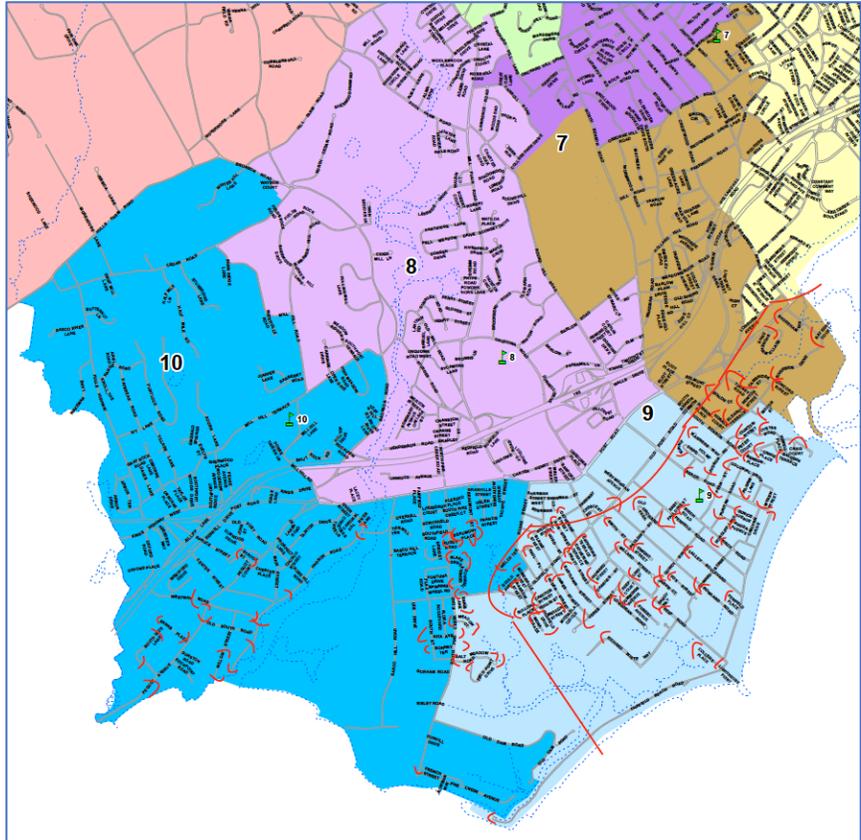
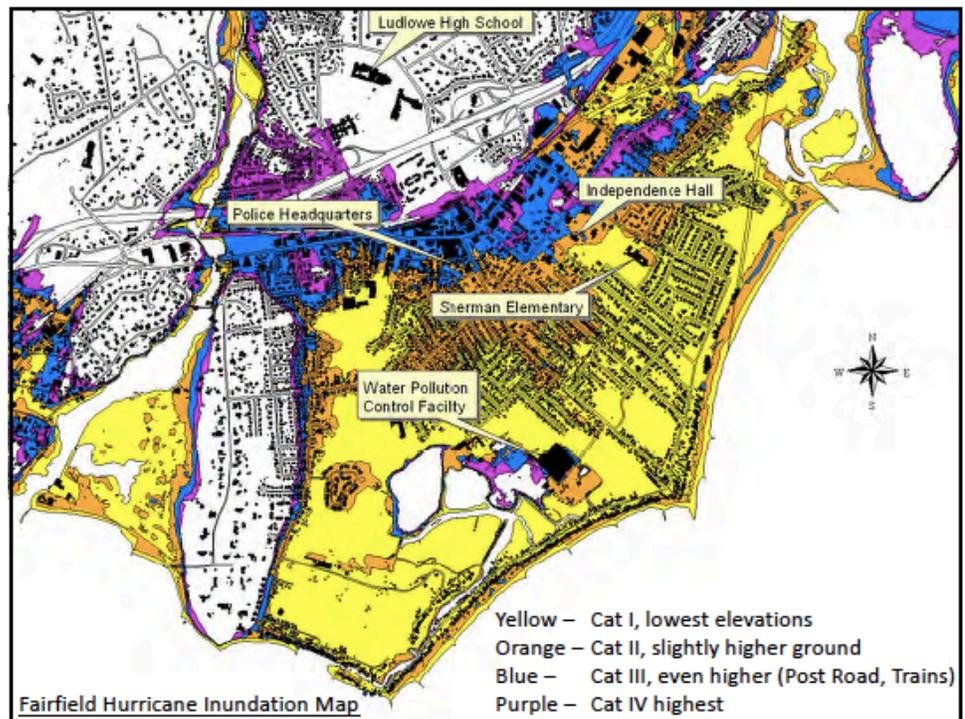


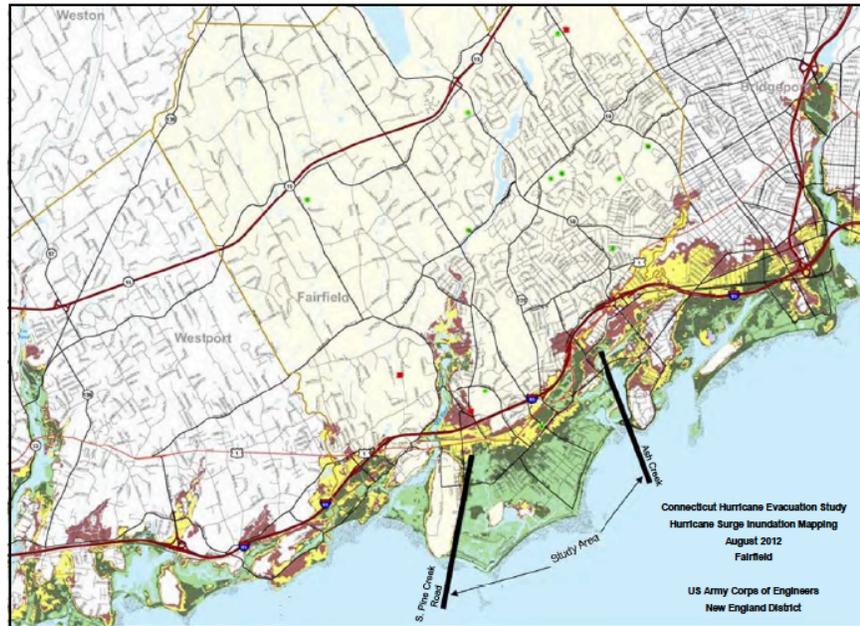
Figure 3  
Fairfield  
Hurricane  
Inundation  
Study Map



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A hurricane surge inundation map (Figure 4)<sup>7</sup> and a “tentatively selected” mitigation plan (Figure 5)<sup>8</sup> for Fairfield produced by the US Army Corps of Engineers are shown below.

Figure 4  
Connecticut  
Hurricane  
Evacuation Study



## TENTATIVELY SELECTED PLAN (FAIRFIELD ALT 3)

Figure 5  
U.S. Army Corp’s of  
Engineers: Proposed  
Mitigation Pla



<sup>7</sup> Fairfield Flood Mitigation Status and Plans (2015, January 8). Fairfield, CT, Retrieved from [https://www.fairfieldct.org/filestorage/10736/12067/17055/26401/48812/Fairfield\\_Flood\\_Mitigation\\_Status\\_and\\_Plans\\_-\\_01-06-2015.pdf](https://www.fairfieldct.org/filestorage/10736/12067/17055/26401/48812/Fairfield_Flood_Mitigation_Status_and_Plans_-_01-06-2015.pdf)

<sup>8</sup> US Army Corps of Engineers Coastal Storm Risk Management Study (2019, June 7). Fairfield and New Haven Counties, CT., Retrieved from: [https://www.fairfieldct.org/filestorage/10736/12067/17055/26401/48808/US\\_Army\\_Corps\\_of\\_Engineers\\_-\\_Coastal\\_Storm\\_Risk\\_Management\\_Study\\_-\\_June\\_2019.pdf](https://www.fairfieldct.org/filestorage/10736/12067/17055/26401/48808/US_Army_Corps_of_Engineers_-_Coastal_Storm_Risk_Management_Study_-_June_2019.pdf)

### A. FAIRFIELD FOCUS GROUP FINDINGS

Six major themes were constructed based on the discussion content summarized for the two focus groups. These six themes and their affiliated findings are detailed separately below.

#### 2.1.1 Risk Communication

All thirteen participants from the two focus groups combined have heard of the terms *100-year flood* and *50-year flood*, except for two participants that were unfamiliar with the latter. Participants unequivocally indicated that the terminology of *100-year flood*, for example, is no longer useful, as severe storms or major hurricanes have become more frequent occurrences in recent years. All participants believed that both terms could be either confusing or misleading as well. For instance, participants mentioned that people could be confused by the meaning of “100 years: and think that they will not experience any severe flood in their lifetime. Otherwise, they could be misled to think that a 1% risk is too negligible to require their attention.

Participants suggested that alternative terms should be adopted to more realistically and practically reflect the flood risk faced by the community. Their suggestions include describing the flood risk on an ordinal scale – such as level of risk or level of strength – to make the metric more user-friendly. They further mentioned that this could be achieved through placing the focus on the severity of the risk and structural vulnerability, instead of the probability of risk. One participant also lamented the lack of emphasis on effective communication about defining and explaining these concepts in the larger context of climate change.

#### 2.1.2 Recovery Experience

About one-third of the participants have experienced flood damage on their property due to *Super Storm Sandy*. Nearly half of them had either a positive or negative experience with FEMA or the insurance company. It was a challenging learning experience for them to understand how recovery works, as well as the delays caused by bureaucracy and minute insurance policy details. All of those experiencing property damage indicated that they endured a lot of hardship and life disruption, due to the flood damage, which made their property uninhabitable up to weeks (or longer). They also acknowledged that the flood experience has engendered on-going concerns with the future safety of their property.

#### 2.1.3 Anticipation and Fear

All participants anticipated that another *Sandy*-like storm could occur during the next hurricane season. They also expressed frustration, anxiety, fear and/or depression associated with the need for mitigation and the potential of facing another severe weather disaster. Most participants pointed out that continuing development of large and upscale residential homes on the coast seems counterproductive to “the mitigation plans recommended” or “implemented” by the Department of Energy and Environmental Protection (DEEP).<sup>9</sup> They believed that factors such

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<sup>9</sup> “The Connecticut Department of Energy and Environmental Protection (DEEP) is charged with conserving, improving and protecting the natural resources and the environment of the state of Connecticut as well as making cheaper, cleaner and more reliable energy available for the people and businesses of the state.” (See [https://www.ct.gov/deep/cwp/view.asp?a=2690&q=322476&deepNav\\_GID=1511](https://www.ct.gov/deep/cwp/view.asp?a=2690&q=322476&deepNav_GID=1511)).

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as zoning regulation and construction location on the beach front as approved by the local municipality could undermine DEEP's direction of mitigation policy.

### **2.1.4 Resilience Knowledge**

Participants appeared to be familiar with the basic or commonly adopted mitigations strategies to reduce flood and erosion damage. Specifically, they suggested different techniques that could be adopted such as the use of reef balls (referenced as a strategy used by the Town of Stratford), breakwalls, bulkheads and seawalls as well as elevating residential structure and the interior utility system. Some also commented that zoning of housing construction in areas such as beach cliffs or high-risk areas is a concern for implementing any effective mitigation practice. Even though none mentioned any living shoreline solutions, participants were familiar with the utilization of built structures and hand-made solutions (e.g., home-made sandbags) to prevent erosion and reduce flooding damage around their own property and homes in their neighborhood. One participant criticized "poor dredging of *Pine Creek* after *Hurricane Sandy*." Others stated that "inadequate measures" or "inadequate strategies" have been put in place for dealing with the forthcoming effects of climate change. Still others pointed out their disagreement with the government policy (i.e., DEEP) on flood and erosion mitigation planning. It appears that participants understand the basic mitigation strategies but don't have sufficient in-depth knowledge about the effectiveness of these strategies, if the strategies are applied to reduce the flood and erosion challenges across different locales in practice.

### **2.1.5 Motivations and Barriers**

Some participants stated that past flood experience could help motivate a property owner to support the resilience plans proposed for the Town. Others suggested that individual motivation, a united community voice and/or the necessary funding can lead to more certainty in identifying effective mitigation solutions and overcome the barriers to support DEEP's policy proposals. However, participants did not feel optimistic about protecting their property with most of the known mitigation strategies. Most of them also did not feel confident that DEEP could receive sufficient community support for their "mitigation plans" or successfully address the flood and erosion challenges. Participant perceptions of how other members of the Town have responded to the effects of flood and erosion provide a good glimpse into their own perceived lack of self-efficacy and collective efficacy in confronting these negative environmental impacts in their community. The seemingly pessimistic comments they shared include: (1) "not in my backyard" mentality from some residents at the Town level; (2) Town residents' denial of the hazards (caused by flood/erosion); (3) community residents' low awareness or skepticism of the beach as an economic asset; and (4) Town residents' resentment toward beach property owners. Others appeared to disagree with "DEEP's approach" to resilience planning, which they perceived to be placing an emphasis on building the coastal environmental resilience that may not provide the needed protection for their own beach property.

### **2.1.6 Potential Policy Options**

Participants were asked to evaluate a hypothetical public policy option, using the annual flat parcel tax model (\$12 per parcel) implemented in nine counties of the San Francisco Bay area as an example; this San Francisco area policy will raise \$500 million over 20 years to implement

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mitigation projects to preserve the natural environment of the Bay. Nearly all participants believed that a parcel tax at a higher amount than \$12 and is prorated, based on proximity to beach could garner support from the community. But none was certain about the dollar amount necessary for implementing this hypothetical taxing model to generate enough funds for implementing local mitigation projects, due to the much smaller population base in CT's coastal communities, relative to that of San Francisco. While some participants suggested that the parcel tax should not be a statewide mandate, others considered bonding to be a better policy option. Still, one participant cautioned that that creating a tiered parcel tax system will be challenging and another maintained that Fairfield residents are already paying high property taxes.

### 2.1.7 Summary Analysis

The summary analysis suggests that participants desire more effective communication from relevant government agencies and the science community when they explain the concepts related to coastal flood risk. They emphasized that utilization of more intuitive and easily accessible terminology to present the flood-risk information would allow them to become better-educated about how to interpret the risk prediction metrics; in turn, this would enable them to make a more informative evaluation about their own risk associated with future flood events.

For those who endured and recovered from the damage caused by Hurricane Sandy, their experience with post-storm recovery was mixed. The lesson that these respondents learned from such experience has triggered continuing concerns with their quality of life and the safety of their property. As such, most participants expressed frustration, anxiety and fear about the uncertainty surrounding what potential disaster that the next superstorm event may bring and when it may arrive. Some of them did not feel confident about whether “effective mitigation strategies” could be implemented by DEEP, through referencing “the inconsistencies between local community practice and DEEP’s “mitigation planning” as an example.

Most participants displayed familiarity with basic mitigation strategies that could help reduce the flood and erosion damage, they were equally disillusioned with the ability of their community and DEEP<sup>5</sup> to share the same vision in mitigation planning and decision-making. As for the potential of proposing a hypothetical parcel tax as a supplemental source to fund mitigation projects in the future, some participants believed that the policy is worth further consideration, but most were concerned about the added financial burden on taxpayers.

## B. FAIRFIELD SURVEY FINDINGS

In total, 302 valid survey responses were gathered from the three districts targeted in the Town of Fairfield. The response category “Refused to Answer” was provided for each survey item of the questionnaire. Likewise, the response category of “Don’t Know Enough to comment” or “Not Applicable” was included with the survey items, whenever appropriate. Data associated with all three response categories were treated as “missing values” when performing statistical analysis; for this reason, they were not included in the results reported below.

To summarize and present the large amount of survey findings, 21 different conceptual clusters have been identified and explicated below.

### 2.2.1 Resident Characteristics

Survey respondents from the Fairfield project site have a very high home ownership rate, with 78.1% reporting that they own at least one residential home and another 14.6% indicating that they live in a rental home. Within a household, the average number of residents is 2.89 ( $SD = 1.22$ ). Of all households, 49.8% have at least one dependent child. On average, respondents have lived in Fairfield for 12.5 years; 62.9% of them are employed full-time and another 13% employed part-time. The average age of respondents is 47.6 years old ( $SD = 2.72$ ). While their median annual household income is \$150,000, 85.7% of the respondents reported that they have at least a four-year college degree. Of all respondents, 46.2% are males and 53.5% are females; another 0.3% identified their gender as “other.”

The current sample’s gender ratio is comparable to that of the 2017 U.S. census data, which reports a gender ratio of 53% female to 47% male for adults; the census data does not contain the “other” gender category. In terms of racial composition, the current sample shows that 88.1% of the respondents are White, 0.7% Black/African American, 1.7% Hispanic, 3.6% Asian, 0.7% Pacific Islanders, 1.7 other race, and 1.3% mixed race. Compared to the census data, it appears that while the current sample has similar representation for “Whites” (85%) and “other race” (0.3%) categories, other racial groups – including Black/African American (1.4%), Hispanic (6.3%), Asian (4.5%), and two or more race (2.4%) – are slightly underrepresented.<sup>10</sup>

### 2.2.2 Property Damage

Nearly one out of three respondents reported that their property had sustained damage impacted by *Hurricane Sandy* (31.8%) or past flood events (32.5%). Another 16.2% of the respondents had a similar experience with their properties that were located elsewhere and due to other past flood events. While 5% of all respondents mentioned on-going damage caused by recent flood events, 27.2% indicated no on-going damage associated with these flood events. About one-third of the respondents (32.8%) indicated the need for more repair of their homes to fend off heavy rain and 39.6% of the respondents also reported an increase in maintenance costs to keep their property safe.

These findings suggest that as nearly one-third of all respondents have experienced property damage due to *Hurricane Sandy*; this experience has caused on-going problems for about 5% of their homes and long-term financial burden for property maintenance. At least one-third of all respondents cited long-term financial burden for property maintenance. Of all respondents, 6% indicated that they would consider moving to another city to avoid the risk of having flood damage to their homes in the next three years.

### 2.2.3 Economic Impact

Respondents were instructed to evaluate any on-going negative economic effects on their property, household and the community, due to past flood events. Results reporting the

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<sup>10</sup> United States Census Bureau, [https://factfinder.census.gov/faces/nav/jsf/pages/community\\_facts.xhtml?src=bkmk](https://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml?src=bkmk)

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percentage of respondents that *agree* or *strongly agree* with the *negative economic effects* on a set of financial or economic indicators are shown below.

- one's own property value: 32.1%
- the property value of neighboring streets: 39.6%
- the property value in the community in general: 42.9%
- one's own household: 23.3%
- the financial resources of the community: 55.6%
- the cost of maintaining public infrastructure in the community: 70.7%
- the taxpayers' burden in the community: 75.2%
- small businesses in the community: 33.5%
- large companies in the community: 20.4%

In addition, respondents were also directed to answer questions regarding their insurance premiums. Perceived burden of increased property insurance premiums was reported by 57.1% of the respondents. While 51.3% of the respondents indicated that their property insurance premium has become very costly, 18.3% stated that this premium has become unaffordable.

Combined, these findings describe that more than half of the respondents felt burdened with rising property insurance premiums. Nearly one-third of them were worried about the property values of their homes, neighborhood and the community, in addition to the viability of small businesses in the community. Most respondents were concerned with the cost required to maintain the infrastructure in their community, alongside the related taxpayer burden and available financial resources in the community. Less than one-quarter of them perceived negative economic consequences on their household finances or large companies in the community. These findings suggest that a majority of respondents are concerned with the rising costs of maintaining their quality of life in the community due to past flood events, even as most don't perceive an adverse effect on personal finances.

### **2.2.4 Risk Severity and Vulnerability**

Respondents were asked to describe the perceived severity of flood, erosion and storm surge risk to which their own property and the properties in their neighborhood is exposed. Results presented below detail the percentage of respondents who consider the severity of their risk to be *negligible*, *mild/moderate* or *severe/critical*.

- Exposure to flood risk on one's own property: negligible (28.9%); mild/moderate (58.4%); severe/critical (12.8%)
- Exposure to flood risk in the neighborhood: negligible (17.1%); mild/moderate (54.4%); severe/critical (28.5%)

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- Exposure to flood-induced erosion on one's own property: negligible (41.6 %); mild/moderate (47.3%); severe/critical (11.1%)
- Exposure to flood-induced erosion risk in the neighborhood: negligible (26.8%); mild/moderate (49.6%); severe/critical (23.5%)
- Exposure to the impact of storm surge on one's own property: negligible (34.2%); mild/moderate (51.7%); severe/critical (14.1%)
- Exposure to the impact of storm surge in the neighborhood: negligible (22.4%); mild/moderate (47.2%); severe/critical (30.4%)

Respondents were also asked to describe the vulnerability they feel toward the potential occurrence of another *Sandy*-like super-storm. The description below details the percentage of respondents that either agree or strongly agree with each aspect of this vulnerability sentiment, if a flood strikes the community during a super-storm.

- Afraid for your personal physical safety: 49.3%
- Fearful for potential damage to your home: 77.5%
- Worried about potential damage around your property: 86.2%
- Anxious about potential need for evacuation: 69.2%
- Concerned about potential financial losses: 78.6%

It appears that in each risk scenario, at least 50% of the respondents reported that their risk exposure ranges from mild/moderate to "severe/critical. Results also show that between nearly half to over 86% of all respondents either agreed or strongly agreed with each of the items in the vulnerability index, including personal safety, property damage and financial losses. These findings suggest a grim portrayal of the psychological fear for the severity and vulnerability associated with flood risk, which appears to burden more than half of all respondents.

### 2.2.5 Mitigation Effectiveness Evaluation

A list of commonly proposed mitigation strategies was presented to respondents to explore their beliefs about the effectiveness of these strategies. Results reported below describe the percentage of respondents who feel *confident* or *very confident* with each of the mitigation strategies presented to them.

- Raising levees: 32.5%
- Deepening river channels: 35.7%
- Improving the storm water network: 49.6%
- Building structures such as ripraps, revetments or bulkheads: 45.1%
- Moving houses away from high-risk areas: 37.2%
- Increasing natural buffers like tidal wetlands, salt marshes and ponds: 54.3%
- Laying natural barriers such as dunes or intertidal flats: 53.9%
- Constructing flood walls: 41.8%

## BUILDING RESILIENT COASTAL COMMUNITIES

- Modifying buildings (e.g., raise floor levels and utility services; fill in basement, if permitted by zoning): 51.5%
- Restricting new buildings or renovations in areas with high flood risk: 56.6%

The findings presented above suggest that at least half of all respondents are confident about three key strategies that could be effective in mitigating the flood/erosion risk. These three strategies include: 1) installing living shoreline solutions such as dunes, intertidal flats, tidal wetlands, salt marshes and ponds; 2) implementing building modification such as raising floor/utility service levels – as well as restricting new construction and renovation of existing buildings – located in areas with high flood risk; and 3) improving the storm water network. The next set of mitigation strategies in which the respondents indicate confidence are those that rely on the construction of physical structures such as ripraps, revetments and bulkheads; these are followed by building flood walls. Just over one-third of the respondents thought strategies that require altering the existing structures – such as moving houses away from high-risk areas, deepening river channels and raising levees – could be effective mitigation strategies.

Based on these results, it is clear that at least half of the respondents have a good understanding of the hierarchy of mitigation strategy effectiveness, which appears to coincide with the level of difficulty in mitigation strategy implementation. Of great interest here is the finding revealing the endorsement of adopting natural buffers for reducing flood and erosion risk, as such living shoreline solutions offer multiple benefits to the community. These benefits could include (but are not limited to) preserving the natural environment – to allow nature to sustain itself by taking a gentle “human-managed” course and restore the ecosystem by allowing preferred vegetation and wildlife to thrive – as well as provide recreational opportunities to increase the community’s quality of life.

### 2.2.6 Mitigation Barriers

An assessment of respondent beliefs about the factors that may obstruct the success in reducing flood risk for residential homes was advanced. Results shown below describe the percentage of respondents who either *agree* or *strongly agree* with the statements that reflect the *barriers* against reducing flood risk in residential homes.

- The costs for flood management are too high: 74.8%
- Special skills are required to know how to manage flood risk: 68.7%
- Special information is required to know what flood-risk management involves: 73.2%
- Other priorities can outrank the need to manage flood risk: 80.2%
- Don’t believe that serious flooding will occur in the foreseeable future: 39.8%
- Floods don’t happen often enough to make flood-risk management a high priority: 42%
- The information about flood risk is not reliable: 24.5%
- Flood-risk management may not be enough to reduce the risk: 54.5%
- Managing flood risk is too challenging to achieve: 27.6%
- Those who live in the floodplain don’t care enough about their flood risk: 31.7%

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- Don't want taxes to go up to help pay for flood-risk management: 71.9%
- Don't want any flood management construction to block the view from residential property: 48.6%
- Those who are not exposed to flood risk don't care: 58.4%

Results reported above reveal that the most dominant barrier has to do with a belief associated with a practical consideration: other priorities in life outrank the task of reducing one's flood risk, as indicated by over 80% of all respondents. This practicality is also evidenced by belief factors such as – financial cost concern and individual tax implications as well as the need to acquire specific information and skills for practicing mitigation actions – as reported by over 70% of all respondents. Other perceived barriers appear to suggest beliefs that range from wishful thinking (e.g., no serious floods in the near future) and distrust in others (e.g., due to their apathy), to a lack of self-efficacy (e.g., perceived powerlessness or fatalism), when reducing flood risk for one's home is being considered.

### 2.2.7 Mitigation Motivations

To contrast with the belief factors that could serve as barriers for supporting flood-risk management actions, questions that explore the key motivations for property owners to support such actions were gauged. The results detailed below represent the proportion of respondents that answered “yes” to each motivation measure.

- your property was flooded before: 42.5%
- you live in a floodplain: 57.2%
- you want to protect your property value: 86.7%
- you live near a floodplain: 64.1%
- your property may be at risk for future flooding: 69.5%
- your taxes may go up, if flood-risk management is not implemented: 83.3%

he motivations that stood out most are financially related; these include respondent concerns with their property value and property tax burden. Surprisingly, having their property flooded before or living in a floodplain was not one of the top motivations for supporting the planning or implementation of community mitigation actions. These findings imply that short-term financial loss or consideration seems to outpace perceived needs for long-term risk-management to protect lives and properties in the community.

### 2.2.8 Self-Efficacy for Mitigation

Respondent beliefs about their ability to engage in mitigation activity independently or with social support from close others were investigated. Specifically, a set of questions that examine their confidence level in taking the following actions to reduce flood risk was posed to them.

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Results reported below describe the percentage of respondents who feel *confident* or *very confident* with each potential requisite action.

- Try to come up with a strategy about what to do: 47.7%
- Construct an actual plan of action: 48.3%
- Have enough financial resources to implement your plan (e.g., a flood-risk reduction project): 37.9%
- Have enough support from (e.g., family and friends) to help you implement your plan: 53%
- Decide how you might best handle the problem (e.g., taking out a loan, as needed): 42.8%
- Carry out your action plan regardless of the difficulty: 47.4%

Results indicate that respondents are *most confident* about having sufficient social support to implement such a plan. They are *least confident* about having sufficient financial resources to implement the plan. Consider the fact that Fairfield residents represent one of the wealthier populations in CT and even the country as a whole, the challenge of financial resources perhaps goes beyond whether flood-risk mitigation is a priority in household finances. It is likely that the inability (or unwillingness) to allocate financial resources for flood-risk reduction is systemic and cannot be easily overcome through government subsidies, such as tax credit or post-disaster recovery financial assistance.

As the success or failure of individual property owner's flood-risk mitigation action is in part or heavily dependent on other property owners' risk-reduction behavior or lack thereof, the "public good" nature of effective flood-risk management then makes clear the necessity for having neighbors work with neighbors as well as a collective community will. In other words, individual efficacy alone is a necessary but insufficient prerequisite for flood-risk management planning and implementation in the community. Collective (community) efficacy is necessary and will improve the odds for developing and implementing more effective flood-risk mitigation plans.

### **2.2.9 Collective Efficacy for Mitigation**

Respondent beliefs about their ability to engage in mitigation activity collectively with others in the community were examined. A series of questions that query their confidence level in working with others to reduce flood risk was presented. Results shown below describe the percentage of respondents who *feel confident* or *very confident* in their ability to work with community members in developing flood-risk management plans.

- work with others to develop community-based solutions: 23.4%
- participate in local activities or events that educate residents about flood risks: 23%
- contribute money to local events that promote flood risk management: 17.2%
- contribute food to local events that promote flood risk management: 27.3%

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- participate in public meetings to offer feedback on flood-risk management plans: 23.1%
- attend public workshops to participate in flood-risk management planning: 22.9%

Findings indicate that respondents' confidence level in community action is generally low. Up to just over a quarter of them believe that they could work with local residents and attend local events to collectively engage in addressing the solutions for flood-risk management. This suggests that the planning and implementation of public engagement activity and grassroots organization efforts should carefully entertain what types of events, venues, outreach message and communication channels may best capture the residents' attention and interest. A successful engagement strategy will allow the communication of a narrative that emphasizes the establishment of a network of friends, neighbors and stakeholders – including business owners, institutions and government representatives – is the key to develop collective efficacy. This narrative should clearly make the case for why collective efficacy is the most effective way to take on the flood-risk mitigation challenges for the community as a whole.

This all-important outreach endeavor could aim to rally community residents at religious gatherings, school-based activities (e.g., PTA meetings and open house events), community-based children's extracurricular activities (e.g., popular K-12 activities such as soccer, baseball, or basketball leagues; science camps; arts/crafts programs; and the like), community-based socials (e.g., arts fairs, food fairs, summer concerts in the park, or 4<sup>th</sup> of July celebratory events) and cultural activities (e.g., arts and crafts fairs and community theatre), among others. The significance of this type of community organization could not be overstated, in light of the fact that risk communication should aim at commanding the attention of and builds social capital with an overwhelming majority of community members.

### 2.2.10 Institutional Efficacy for Mitigation

Respondent beliefs about the ability of institutions to address community mitigation needs and to reduce community flood risk were also measured. A comprehensive list of institutions, including news media and the science community, were included for measurement. Results shown below describe the percentage of respondents who feel *confident* or *very confident* in the ability of these institutional players in helping to reduce community flood risks.

- municipal government that responds to the needs of its residents: 27.6%
- community leaders that organize the residents to contribute to local flood-risk management: 28%
- scientists and engineers that provide assessments of the actual flood risk: 57.6%
- government agencies that could implement flood-risk management plans: 25.5%
- news media that report the flood risk: 26.4%
- the City Council or its equivalent that speaks for the people they represent: 23.8%
- the local law enforcement that protects the safety of your community: 53.1%
- the state law enforcement that protects the safety of your community: 40.4%
- the federal law enforcement that protects the safety your community: 25.5%

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These results reveal that respondent confidence in local governments and community leaders are low, compared to local and state law enforcement units. Likewise, respondent confidence in news media is also low. Just below 60% of all respondents (57%) appeared to have sufficient confidence in the ability of scientists and engineers to address their community's flood-risk mitigation needs, relative to all the other institutions or entities. This 57% statistic compares favorably to the 39% of U.S. adults that indicated they “trust climate scientists to give full and accurate information on the causes of climate change” – but unfavorably to the 67% that believed “climate scientists should have a major role in policymaking decisions regarding climate change” – via a 2016 national poll.<sup>11</sup>

As nearly 86% of the respondents reported having attained at least a four-year college degree, this education level might have helped boost respondent confidence in science. Education level notwithstanding, other perceptual factors<sup>12</sup> such as psychological distance toward the concept of climate change, social distance toward individuals subject to flood risk, spatial proximity to coastal living, temporal distance toward flood events – as well as political ideology, among others – could also shape an individual's trust in science as the foundation for developing sound mitigation strategy.

With regard to political ideology, a national poll reported that political party affiliation could play a role in how trust in climate scientists is evaluated.<sup>13</sup> The poll results demonstrated that while 15% and 32% of conservative and moderate Republicans would trust climate scientists “to give full and accurate information about the causes of global climate change,” respectively, 75% and 45% of liberal and moderate Democrats would give the same trust, in that order. In addition, 48% and 69% of conservative and moderate Republicans – as well as 80% and 76% of liberal and moderate Democrats – believed that climate scientists “should have a major role in making decisions about policy issues related to global climate change.”

By implication, when public confidence in the ability of the institutional players in flood-risk management is low, this low confidence could lead to other downward cognitive, affective or behavioral responses such as low efficacy, pessimism, avoidance, inertia or lack of initiative. Faced with the recurring threat of chronic flood and erosion consequences, it is clear that risk communication strategies should consider addressing this issue of low public confidence in institutions, or low public trust in governments in general.

### 2.2.11 Mitigation and Preparedness Action

To assess whether respondents have taken up any mitigation measure on their own to reduce their flood, erosion and storm surge damage since *Hurricane Sandy*, a list of questions were

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<sup>11</sup> Brian Kennedy (2016, December 5). Many Americans are skeptical about scientific research on climate and GM foods, Pew Research Center, retrieved from <https://www.pewresearch.org/fact-tank/2016/12/05/many-americans-are-skeptical-about-scientific-research-on-climate-and-gm-foods/>.

<sup>12</sup> Griffioen, A.M., van Beek, J., Lindhout, S. N., & Handgraaf, M. J. J. (2016). Distance makes the mind grow broader: An overview of psychological distance studies in the environmental and health Domains. *Applied Studies in Agribusiness and Commerce*, 10 (2-3), 33-46.

<sup>13</sup> Brian Kennedy (2016, October 4). Conservative Republicans especially skeptical of climate scientists' research and understanding. Pew Research Center, retrieved from <https://www.pewresearch.org/fact-tank/2016/10/04/conservative-republicans-especially-skeptical-of-climate-scientists-research-and-understanding/>

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posed to them. Findings below describe the percentage of respondents who reported that they have implemented any of the following mitigation measures.

- Raised the foundation of their property: 5.3%
- Have kept ditches and drains around the property clean: 52%
- Have raised electrical outlets and switches: 13.2%
- Have made a plan about what to do, if a flood is threatening (e.g., evacuation): 43.4%
- Have compiled a disaster preparedness kit (e.g., first-aid kit, blankets, pet carrier): 36.8%
- Have stocked up on emergency survival items (e.g., canned goods, flashlights, batteries): 43%

These results reveal an insufficient level of preparedness action, as less than half of the respondents have made plans to adapt to a potential flood event. The level of mitigation action, which may be dictated by the flood-risk level or past damage, likewise could be raised. These findings hence signify the need for addressing individualized risk communication that could “teach” simple preparedness skills and increase behavioral intention toward adopting flood-risk mitigation measures among respondents.

### 2.2.12 Risk-Management Responsibility

A set of measures were provided to help gauge respondent beliefs about who should be responsible for managing flood risk in their community. Results detailed below indicate the percentage of respondents who *agree* or *strongly agree* with the parties that are responsible.

- Those who own properties in the floodplain in your community: 69%
- Those who own properties that were affected by floods in your community: 67.8%
- Those who live in your community (municipality): 74.5%
- Residents that are exposed to flood risk in your region: 73.6%
- Residents that are exposed to flood risk in Connecticut’s coastal communities: 72.6%
- Residents who live in Connecticut’s coastal communities: 66.8%
- Residents who live in the State of Connecticut: 38.6%
- Taxpayers in the country: 35.5%

Nearly three-quarters of the respondents believed that residents in the local community as well as those at risk in the region and CT’s coastal communities are responsible for managing their local flood risk. Slightly over two-thirds believed that those residents with direct exposure to flood risk should be responsible for flood mitigation. Just over one-third stated that residents in CT and U.S. taxpayers are responsible for reducing coastal flood risk in their community. It is interesting to learn that a large majority of the respondents do not consider taxpayers in the state or the country should be responsible for managing the flood risk faced by property owners as well as residents in local and coastal communities. Yet, respondents’ confidence of the collective efficacy of their community (see Sec 2.2.9) is relatively low, so is their confidence in different

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levels of government (see Sec 2.2.10). As discussed above (sec 2.2.10), building social capital between members of the community and elevating public confidence in institutions would be necessary for successful flood-risk management planning in a coastal Town like Fairfield.

### 2.2.13 Share of Responsibility

Expanding from the measures that assess who should be responsible for mitigating flood risk in their community, respondents were asked to evaluate how important different parties are for the same responsibility. Results below describe the percentage of respondents who consider a given party as being *important* or *absolutely important* in managing local flood-risk concerns.

- Federal Government: 65.9%
- State Government: 81.9%
- Municipal Government: 89.4% important/absolutely important
- Community groups: 62.5% important/absolutely important
- Neighborhood associations: 59.3%
- Individual residents: 72.7%

As shown above, nearly 90% of the respondents believed that the local municipality is the most important entity in mitigation management, followed by the state government. The role of individual residents was believed to be larger than that of the federal government in local flood-risk management. About 60% of the respondents also believed that their neighbors and community groups are responsible for reducing flood risk as well. These findings suggest that respondents consider all stakeholders at the local, state and federal level to be collectively important players in flood-risk management. As such, building trust and confidence in working with others in the community and governmental institutions remains essential for building social resilience in flood-risk management.

### 2.2.14 Risk Anticipation and Decision-Making Style

To further understand the way that respondents may think about the concept of flood-risk management, their beliefs associated with when the next severe weather event such as *Hurricane Sandy* may materialize were also assessed. Results below indicate that just over half of the respondents believed that a *Sandy*-like superstorm could strike again within 1-5 years. Just below 80% believed that this storm could arrive in 10-20 years; this percentage then plateaued for those believing that a superstorm could threaten their community from 20 years out and beyond. These results suggest that there is not a sufficiently large number of respondents who believe a severe weather would occur in the near future. This finding is not necessarily surprising, since 2019 would be the 7<sup>th</sup> anniversary of *Hurricane Sandy*.

- within the next 1 - 5 years: 54.3%
- within the next 5 -10 years: 64.9%
- within the next 10 - 20 years: 77%
- within the next 20 - 30 years: 78.3%

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- within the next 30 - 40 years: 78.8%
- within the next 40 - 50 years: 80%

In conjunction with projecting the arrival of the next superstorm, a set of measures developed to gauge an individual risk-taking (or maximizing the probability for receiving a gain) vs. risk-avoidance (or minimizing the probability for receiving a loss) tendency was also implemented in the survey. The measurement items were developed to test how individuals make decisions based on their evaluation of the risk that they may accept or avoid in order to increase their potential gain and decrease their potential loss.<sup>14</sup>

Specifically, two options below were presented for respondents to determine their risk tolerance level. The findings below show that Option B is significantly more preferred over Option A (Binomial test,  $p = .014$ , 2-tailed). Additional analyses considered whether respondents who have suffered damage from *Hurricane Sandy* (31.8%) or past flood events (32.5%) might have a different preference; results show no statistical difference between those with or without experience with damage from *Sandy* or past flood events (Kruskal-Wallis Test  $>.05$ ).

- Option A: There is an 80% chance that you will save an extra \$1,000 in flood damage repair: 41.5%
- Option B: There is a 100% chance that you will save an extra \$700 in flood damage repair: 58.5%

Another two options were presented for respondents to determine their risk avoidance level. The findings below indicate that Option A is significantly preferred over Option B (Binomial test,  $p = .043$ , 2-tailed). Additional analyses again show no statistical difference between those with or without experience with damage from *Hurricane Sandy* (31.8%) or past flood events (32.5%) (Kruskal-Wallis Test  $>.05$ ).

- Option A: There is an 80% chance that you will lose an extra \$1,000 in flood damage repair: 56.8%
- Option B: There is a 100% chance that you will lose an extra \$700 in flood damage repair: 43.2%

These findings suggest that respondents prefer the choice of minimizing their probability in risk-seeking outcome to maximize their probability for receiving a certain gain. They also favor the idea of maximizing their probability in risk-avoidance outcome to minimize their probability for receiving a certain loss. Through measuring two sets of hypothetical scenarios related to flood-damage repair cost, respondents demonstrated that they are risk-averse -- whether it be receiving a gain or avoiding a loss -- in relation to flood-damage management.

### 2.2.15 Flood Risk Information Dissemination

Turing to the challenge of how best to reach coastal residents with flood-risk forecasts and warnings, when a severe storm looms on the horizon, respondents were asked to report how

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<sup>14</sup> Kahneman, D., & Tversky, A. (1979). Prospect Theory: An Analysis of Decision under Risk. *Econometrica*, 47(2), 263-291.

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often they receive such risk communication from a list of information sources. The following results describe the percentage of respondents who *often* or *very often* received such risk information from each communication source below.

- Weather forecasts in a printed newspaper: 21.3%
- Weather forecasts on a radio station: 36%
- Weather forecasts on a TV station: 56.4%
- The Weather Channel on Cable TV: 48%
- Cable news networks such as CNN, MSNBC or Fox: 33.9%
- Web portals such as Yahoo.com, MSN.com or Google.com: 42.4%
- Local news outlets on the Internet, e.g., a local newspaper, radio station or TV station: 49.5%
- Major national news outlets on the Internet, e.g., USA Today, CNN, MSNBC or Fox: 36.3%
- Facebook, a social media outlet: 23.5%
- YouTube, a social media outlet: 8.4%
- Twitter, a social media outlet: 10.8%
- Instagram, a social media outlet: 11.1%
- Reddit, a social media outlet: 3.8%
- Snapchat, a social media outlet: 4.3%
- Other social media outlets, such as Snapchat, Tumblr or WhatsApp: 4.1%
- Mobile phone applications, e.g., a weather forecast app: 62.8%
- CT Alerts, a mobile app from the state's Emergency Alerting and Information System: 54.9%
- A newsletter through an email account: 15.5%
- A family member: 38.7%
- A relative: 30.5%
- A friend: 36.6%
- neighbor: 34%

Findings suggest that weather forecast applications for mobile phones led the pack and were the primary source of flood-risk information for about 63% of all respondents. Weather forecasts on local TV stations, CT's emergency alert mobile phone application and local news outlets online were the second most cited information sources, selected by approximately 50%-57% of the respondents. The Weather Channel (on cable TV) and web portals such as Yahoo.com were the information sources for between 42%-48% of the respondents. Weather forecasts on radio stations, national cable news networks and major national news outlets on the Internet as well as interpersonal contacts between family members, friends, relatives and neighbors were mentioned

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by 31%-39% of the respondents as their information sources. Aside from Facebook (chosen by about 24%), all other social media outlets were selected by about 4%-11% of the respondents as their flood-risk information sources.

By implication, mobile phone applications may be the best communication channels for most respondents to receive flood-risk information; local and national TV and radio news outlets as well as interpersonal networks may work best for those who don't rely on mobile phones for informational learning as much. Social media, despite their status as the communication channels that reach the most humans around the world, remain the least utilized when it comes to receiving disaster communication. The only exception is Facebook, which was mentioned by nearly one-quarter of the respondents as a digital media outlet that keeps them connected to weather alert information. This finding might reflect the audience's social media use preference, which demonstrates that Facebook has several more times as many users as the second most popular social media outlet at any given time.

### 2.2.16 Potential Policy Options

Respondents were introduced to a parcel tax policy that has been implemented in nine counties of the San Fran Bay area as an example of a community-based funding option for implementing flood-risk mitigation in coastal communities. They were then presented with two separate series of questions targeting coastal communities vs. local community (municipality) as the taxing unit, in addition to the preferred dollar amount for the hypothetical annual tax. *Coastal Community Parcel Tax Policy*

The first question concerns collecting a hypothetical parcel tax for the next 20 years to help fund flood-risk management plans across CT's coastal communities. Results below display the percentage of respondents who perceive whether such a parcel tax will receive *support* from each household or property owner type.

- Your household: 64.1%
- property owners on your neighborhood: 55.5%
- property owners in your municipality: 55%
- property owners in the most at-risk coastal communities on Long Island Sound: 78.4%
- property owners in the coastal communities on Long Island Sound: 74.5%

The second question asks whether this annual parcel tax collected in CT's coastal communities should be designated as a flat fee or a prorated fee. Results below indicate the percentage of respondents who *support* each type of fee option below.

- a flat fee for all residential property owners: 40.4%
- a flat fee for non-residential properties, including commercial and non-commercial properties: 45.4%
- the same flat fee for both residential and non-residential properties: 32.1%
- a prorated fee based on the parcel size of the property: 51.7%

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- a prorated fee based on the proximity of the property to the floodplain: 59.6%
- a prorated fee based on the income level of the parcel owner: 31.1%

The third question asks how much this parcel tax should be, if it is designated as a flat fee and collected by CT's coastal communities annually. Results below show the percentage of respondents who *support* each type of tax rate below.

- \$20 per year or 5.5¢ per day: 54%
- \$30 per year or 8.2¢ per day: 24.5%
- \$40 per year or 11.0¢ per day: 17.2%
- \$50 per year or 13.7¢ per day: 22.8%
- \$75 per year or 20.6¢ per day; 18.2%

### *Municipal Parcel Tax Policy*

The first question inquires whether the same parcel tax policy will receive support from the respondent and the property owners in their community, if it is proposed by their local municipality. Results below describe the percentage of respondents who perceive whether such a parcel tax will receive *support* from each household or property owner type.

- Your household: 68.3%
- property owners on your neighborhood: 56.1%
- property owners in your community (or your municipality): 52%

The second question asks whether this annual parcel tax collected by the local municipality should be designated as a flat fee or a prorated fee. Results below reflect the percentage of respondents who chose to *support* each hypothetical fee option.

- a flat fee for all residential property owners: 40.4%
- a flat fee for nonresidential properties, including commercial and noncommercial properties: 42.1%
- the same flat fee for both residential and nonresidential a prorated fee based on the parcel size of the property: 36.8%
- a prorated fee based on the proximity of the property to the floodplain: 57.3%
- a prorated fee based on the income level of the parcel owner: 31.8%

The third question asks how much this parcel tax should be, if it is designated as a flat fee and collected by their local municipality. Results below reveal the percentage of respondents who chose to *support* each hypothetical tax rate option.

- \$20 per year or 5.5¢ per day: 54.3%
- \$30 per year or 8.2¢ per day: 21.9%
- \$40 per year or 11.0¢ per day: 15.9%

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- \$50 per year or 13.7¢ per day: 21.5%
- \$75 per year or 20.6¢ per day: 19.2%

The take-away from this “experiment” with a novel policy option seems to suggest that respondents believe how distal others (i.e., general property owners in the coastal communities on Long Island Sound) would support the policy more than proximal others (such as their neighbors or member of their own community) would. This scenario seems to hold true in the scenario where respondents believe that general members of their community would support the policy more than their neighbors and member of their immediate community.

As for how the parcel tax should be collected, a prorated method seems to be more preferred than a universal flat rate. This suggests that respondents weigh the tax burden based on the level of benefits received by property owners. The perceived dollar amount that should be collected appears to have a curvilinear distribution; it demonstrates that when the dollar amount goes up, the preference tends to decline. By implication, the wealth level associated with the Fairfield respondents appears to have limited influence on their willingness to accept a non-prorated or modest parcel tax rate.

### 2.2.17 Information and Activity Engagement

Adoption of storm preparation and risk mitigation practice – as well as knowledge about post-storm recovery – is often a result of whether coastal residents have sought the relevant information or activities that could have educated them on these risk avoidance and reduction skills. Respondents answered two sets of questions that inquire about their information- and activity-seeking frequency at an individual and community level, since *Hurricane Sandy*. Results reported indicate the percentage of respondents who *often* or *very often* engage in such actions.

Respondents were asked how often they seek to engage flood-risk related information. About one in ten respondents reported having sought different types of information below.

- flood risk to your property: 10%
- flood risk to your neighborhood: 10.3%
- flood risk to your community: 11.3%
- what to do to help manage a possible flood: 10.7%

Following that, respondents were queried about how often they seek to engage flood-risk related management activities at the community level. Results below show that fewer than 7% of the respondent have ever engaged community groups or the municipal government to seek flood-risk management solutions.

- Become involved with a local community group focusing on flood management: .7%
- Communicated with the city hall about how to reduce flood risk on your property: 4.7%
- Participated in public meetings related to flood-risk management: 4.3%

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The evidence presented above reveals that only a very low number of respondents would seek information about the flood risk to their own property on a regular basis. These low information-seeking frequencies may be indicative of low cognitive involvement with one's own flood risk and low engagement with others to reduce such risk. This phenomenon could be a symptom of inertia or avoidance, which spotlights the need for effective public engagement that could motivate efficacious communication to motivate the subsequent resilience discourse.

### 2.2.18 Communication about Flood-Risk Management Planning

As demonstrated above, only a very small number of respondents have been "pulled" to seek flood-risk related information. It is therefore necessary to know what types of flood-risk management information is considered important to them, in order to develop a "push" strategy to disseminate such information.

Respondents were invited to determine how important it is for them to receive communication about the different types of information related to flood-risk management planning in their community. Results provided below describe the percentage of respondents who consider each entity as being *very important* or *absolutely important*.

- which entities are in charge: 74.2%
- which community groups representing the taxpayers are involved: 69.4%
- which projects will be planned: 78.6%
- which projects are being planned: 81.6%
- which projects will be implemented: 84.9%
- which projects are being implemented: 86.3%
- the costs of these projects: 88.7%
- who is financially responsible for these projects: 89.4%
- what is the share of financial burden on taxpayers like you: 91.2%

Based on the responses shown above, approximately 70% to 90% of all respondents believed that it is important for them to know (1) who is in charge of and who represents the taxpayers in planning these projects; (2) the details about project planning and implementation; and (3) the cost, financial responsibility and taxpayers' financial burden associated with these projects. Hence, respondent need for flood-risk management information is high. As such, attention should be directed to not only make such information available to as many coastal residents as possible, but also ensuring the accessibility of such information in terms of readability and usefulness to diverse population segments of the general public.

### 2.2.19 Communication about Flood-Risk Management Outcomes

Another set of questions was developed to describe how important it is for respondents to receive communication about the anticipated outcomes for flood-risk management planning in their community. Results below reflect the percentage of respondents who consider an outcome to be *important* or *absolutely important*.

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- whether these plans will create a positive economic impact on your community: 77.6%
- whether these plans will influence the recreational opportunities in your community: 72.6%
- whether these plans will improve the quality of life in your community: 83%
- how these plans will affect your property: 90.2%
- how these plans will affect the properties in your neighborhood: 84.1%
- whether the scientific facts back up the rationale for making these plans: 86.7%

These findings indicate that respondents consider how the flood-risk management plans will affect their property, neighborhood and quality of life to be the most important information for them to have. While nearly 88% of the respondents considered that it is important for these plans to be backed by science, between 73%-78% of the respondents also mentioned that it is important for these projects to have a positive influence on the local economy and recreational activity. Based on this evidence, respondent desire for receiving information about flood-risk management outcomes is strong. Again, making the relevant information available and accessible remains the key to a successful risk communication strategy for engaging the residents of this community.

### 2.2.20 Communication Channels for Engagement

Respondents were also asked to indicate what the best ways to communicate with them in order to engage them in flood-risk management planning in the community might be. Results presented below indicate the percentage of respondents who either *agree* or *strongly agree* with each of the following approaches being the best way to communicate with them.

- Invite you to enter your email address in a city registry to receive important announcements: 76.5%
- Invite you to enter your phone number in a city registry to receive important announcements: 54.9%
- Invite you to attend Resilience Fair to enjoy food, games, activities and conversations about building a more resilient community with your friends, neighbors, and community members: 27.8%
- Invite you to form a “neighborhood group” to address neighborhood flood-risk concerns: 35%
- Invite you to participate in “resilient neighborhood” design workshops to help develop flood-risk management plans for your neighborhood: 33.6%
- Invite you to attend public meetings that address community-wide flood-risk concerns: 59.7%
- Invite you to attend “resilient community” design workshops to help develop flood-risk management plans for the community: 40%
- Invite your neighborhood group to work with other neighborhood groups in the community: 39.8%

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These responses illustrate that passive electronic channels (i.e., email and phone modality) – suited for information “*pushing*” and the least amount of time/effort commitment – are the most preferred channels for communication. The next preferred mode of communication would be the occasional public meetings to discuss community-wide flood-risk concerns. Other community-based activities that require more time and effort received less support from the respondents.

### 2.2.21 Engaging the *Flood & Erosion Control Board (FECB)*

As a lead-in to assess community engagement with the *Fairfield Flood & Erosion Control Board (FECB)*, respondents were first asked whether they have heard of Fairfield's resilience project plans before. The answer to this question is that only **12.7%** have heard of such plans.

A series of follow-up questions then gauged respondent interest in engaging the FECB or their neighbors to learn about or participate in flood-risk management planning in the community. Results below reflect the percentage of respondents that indicate they are *interested*, *very interested* or *extremely interested* in such engagement initiatives.

- Visit the FECB website to learn about flood-risk management: 44.1%
- Ask question about flood-risk management by contacting FECB: 31.4%
- Offer your input about flood-risk management by contacting FECB: 25.9%
- Attending the forthcoming public meetings held by FECB: 29.9%
- Attend the upcoming community workshops/presentations held by FECB: 26.5%
- Participate in a “neighborhood group” to address flood-risk concerns in your neighborhood: 23.5%

Between about one-quarter and mid-40% of the respondents were interested in participating in flood-risk management planning through engaging the *FECB*. The snapshot provided here thus suggests that *FECB* could implement outreach events that to introduce itself to and communicate with any Fairfield residents who might be interested in to getting involved with flood-risk management planning.

In particular, Fairfield residents should be made aware of how the ***term-limited citizen-led FECB*** is constituted as well as their chartered powers and duties. These residents would also benefit from engagement activities hosted by the *FECB* to participate in the planning of mitigation projects that will benefit them and their community.

Lastly, respondents were also asked to indicate whether they would like to begin engaging in community-based flood-risk management planning through receiving selected material electronically.

- Receiving a printable flyer that shows you how to access all the resilient project planning resources in the community: 24.7% maybe; 48.3% yes
- Receiving an email alert to learn about when and where a community-based planning event will be taking place: 31.2% maybe; 45.5% yes

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As nearly half the respondents are willing to receive a flyer that will show them how to access the resilient project planning resources for the Town of Fairfield, this is an indication that there is sufficient interest in the community for *FECB* to plan and implement an engagement strategy that could broaden its institutional reach. Likewise, those respondents who express an interest in receiving email alerts for upcoming community-based resilience planning events may provide *FECB* a foundation to build a communication strategy that will deepen their working relations with Fairfield residents as a whole.

### SECTION 3: BRIDGEPORT PROJECT FINDINGS

Data collection was conducted with the residents and stakeholders that are associated with the *Resilient Bridgeport* Project.<sup>15</sup> The *Resilient Bridgeport* project is located in the South End of the City of Bridgeport (see Figure 2.1), which is an area that is chronically impacted by severe flood events and negative consequences of sea-level rise along the Long Island Sound.

*Resilient Bridgeport* is a state-led pilot project that intends to demonstrate how the City of Bridgeport and other Northeastern coastal cities may adapt to the flood and erosion threats stemming from severe weather events, sea-level rise and climate change. The project's concept is based on the 2013 *Rebuild by Design Competition*, which was an initiative originating from the U.S. Department of Housing and Urban Development.<sup>16</sup>

The *Resilient Bridgeport Project* brings together engineers, architects, landscape architects, urban designers, city residents and community stakeholders to design a project plan that could help the South End residents and the City itself fortify a climate adaptive and socially resilient urban community. Within this “cooperative” framework is the notable public engagement effort that provides an open communication forum and hands-on immersive activities. The objective of this engagement effort is to facilitate a free flow of ideas to between the community residents, stakeholders and the urban planning/resilience design practitioners/experts.

The *South End* map shown in *Figure 6* below illustrates the *Resilient Bridgeport* project site. This map is marked with a set of clickable symbols. These symbols are interactively linked to the area's historic landmarks (e.g., Freeman Houses), public parks, industrial buildings (e.g., an energy company), institutional buildings (e.g., the University of Bridgeport), train station, residential areas (e.g., Seaside Village), wetland habitat, bird sanctuary, and more. As demonstrated by this map, the project design takes into consideration residents, recreation, buildings, infrastructure and the natural environment to meet its resilience planning objectives.

*Figure 7* below describes the five distinct zones of the *Resilient Bridgeport* project in the South End neighborhood. Each zone contains a set of color-coded areas that represents different types of institutions, buildings, structures and more.

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<sup>15</sup> *Resilient Bridgeport* is a project administered by the Connecticut Department of Housing Sandy Recovery and National Disaster Resilience programs, funded by the Federal Department of Housing and Urban Development Community Development Block Grant Disaster Recovery program (see Public Law 113-2). (see project details via <https://resilientbridgeport.com/about/>).

<sup>16</sup> For a detailed description of *Rebuild by Design*, see <http://www.rebuildbydesign.org/our-work/all-proposals/winning-projects/ct-resilient-bridgeport>.

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Figure 6 Resilient Bridgeport Project Site in the South End<sup>17</sup>

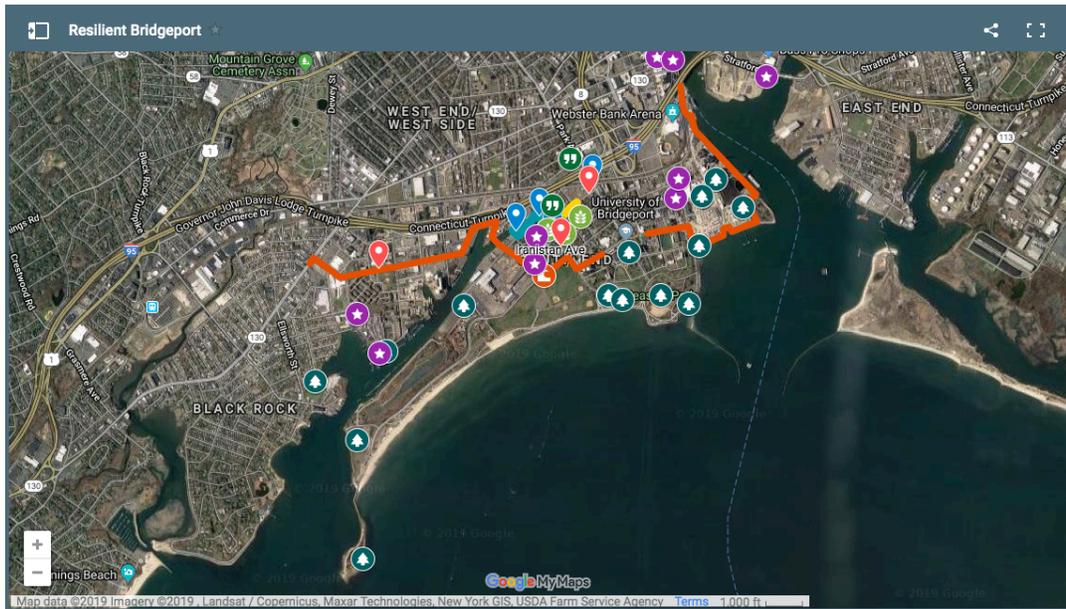
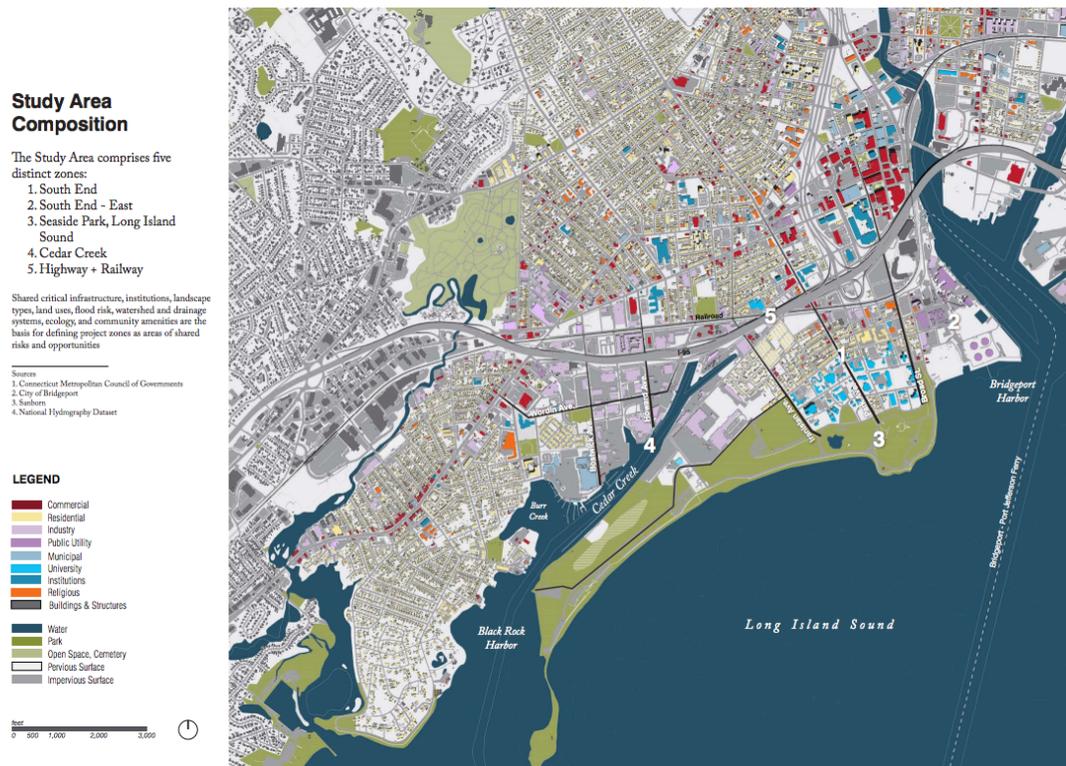


Figure 7 Resilient Bridgeport Project Design<sup>18</sup>



<sup>17</sup> Resilient Bridgeport. Retrieved from <https://resilientbridgeport.com/projects-proposals/>

<sup>18</sup> Resilient Bridgeport (2016, July 12). *Bridgeport Atlas: Design condition report*, p. 45. Retrieved from [https://resilientbridgeport.com/wp-content/uploads/2017/07/170719\\_Atlas\\_sm.pdf](https://resilientbridgeport.com/wp-content/uploads/2017/07/170719_Atlas_sm.pdf).

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The map in Figure 8 illustrates the locations of key stakeholders on the project site.<sup>19</sup> Figure 9 is a sample image of “hands-on” design workshop (involving the use of pins, strings and more).<sup>20</sup>

### Project Overview and Key Stakeholders

Figure 8  
Project  
Overview  
and Key  
Stakeholders

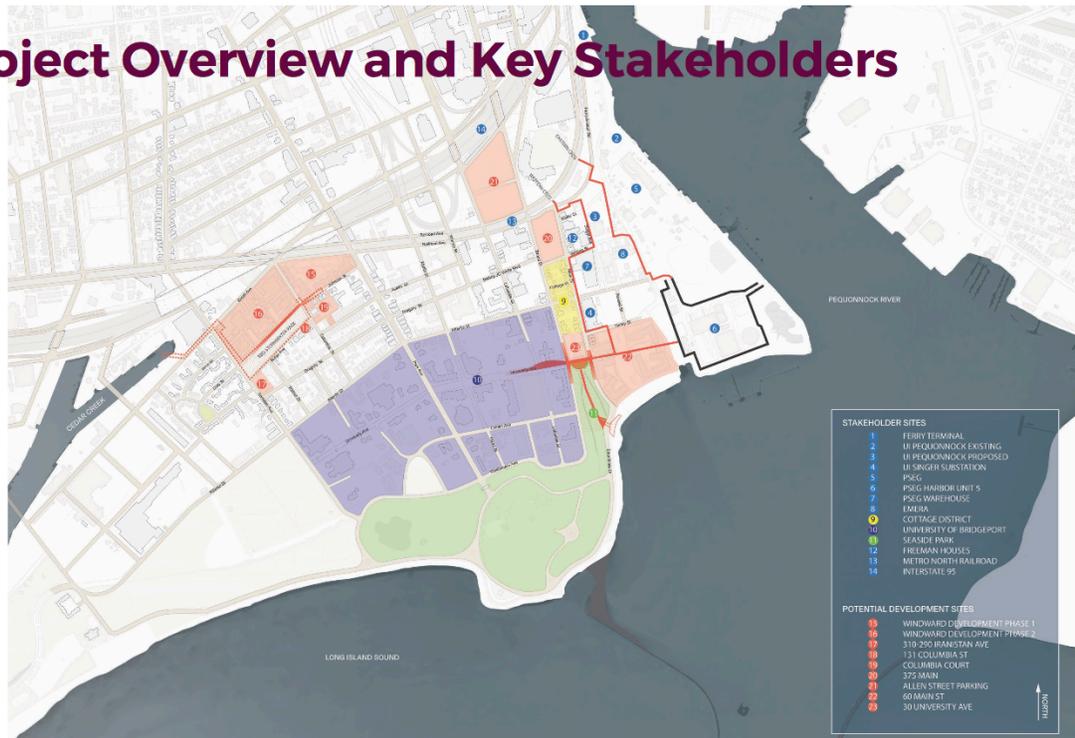
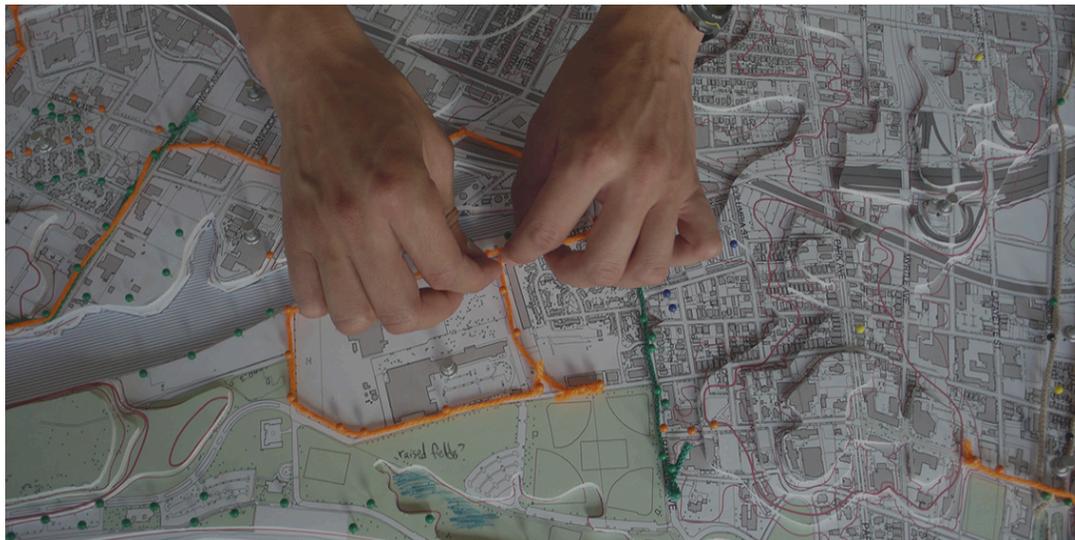


Figure 9  
*Resilient  
Bridgeport*  
Public  
Design  
Workshop



<sup>19</sup> Resilient Bridgeport (2019, February 26). *Design workshop presentation*, p. 23. Retrieved from [https://resilientbridgeport.com/wp-content/uploads/2019/03/20190305\\_Resilient-Bridgeport\\_CTDOH-NOTES.pdf](https://resilientbridgeport.com/wp-content/uploads/2019/03/20190305_Resilient-Bridgeport_CTDOH-NOTES.pdf)

<sup>20</sup> Resilient Bridgeport. Slide show “Resilience Bridgeport comprises” (slide #5). Retrieved from <https://resilientbridgeport.com/about/>

### A. BRIDGEPORT FOCUS GROUP FINDINGS

Six themes were constructed based on the summarized content of the two focus groups. These themes and their affiliated findings are detailed separately below.

#### 3.1.1 Risk Communication

Only six out of the thirteen participants in the two focus groups have heard of the term *100-year flood*; only five of all participants are aware of the term *50-year flood*. Participants indicated that the term *100-year flood* has outlived its usefulness, due to climate change and shorter time span between severe weather events. They also believed that the terminology causes confusion and does not clearly convey its relevance to the type and severity of a flood risk. Some participants described the term *100-year flood* as obsolete and believed that the public has no confidence in what the definition of this terminology means. A similar sentiment was shared by participants about the usefulness or validity associated with the term *50-year flood*.

Participants believed that a continuing update for the metrics that could better describe flood-risk projection to the lay public would be useful. They further articulated the need for framing the metrics with different risk factors that may accelerate or decelerate the probability of occurrence of a severe weather event. They believe that the simple definitions for the terms *100-year flood* and *50-year flood* are not helpful for the citizens who wish to assess their personal flood risk.

#### 3.1.2 Recovery Experience

Nearly 31% of the participants suffered flood damage to their property due to the impact of *Hurricane Sandy*. While an additional participant experienced only electrical outage, another participant witnessed considerable flood damage on the structure of their workplace. A majority of the participants did not have a positive experience in receiving post-disaster recovery assistance from either FEMA or the insurance company. One participant did praise an expedient FEMA response in the form of a bank check to kick start their recovery, immediately after an assessment of the property damage had been completed. Others expressed gratitude toward the help advanced by the co-op insurance policy, Salvation Army and Yale University's Emergency Management Department. Still others complained about either lacking approval for making a damage claim due to co-op regulation, protracted negotiation with the insurance company or even a debt load accruing from prolonged space heater use to stay warm.

#### 3.1.3 Anticipation and Fear

All participants believed that a *Sandy*-like superstorm could arrive in the next hurricane season. While some of them shared the feelings of dread and helplessness when reflecting on their *Sandy* ordeal, others mentioned how they experienced a safe feeling when the National Guard showed up at their doorstep. Still more participants mentioned that they would sometimes choke up or feel like crying, when thinking about what they have endured. Other sentiments expressed include 1) constant anxiety associated with the potential consequences of a heavy rainfall, 2) constant worries over a potential repeat of the *Sandy* devastation, or

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not receiving any assistance in the near future (due to having reached the limit in their insurance benefits); and 3) the feeling of racing against the time. One participant cited the mitigation system of the Netherlands as “exemplary,” as the system “effectively adapts to its natural and changing environment.”

### 3.1.4 Resilience Knowledge

In general, participants seemed to understand the importance of preparedness and mitigation work that is required to reduce their individual/community flood risk. Some emphasized the need to have an advance preparation plan that contains contact phone numbers, evacuation procedure and a meeting place in the event of an evacuation. Others stressed the role of apartment owners in making better preparation and fulfilling their legal obligation of addressing such issue as repairing water damage and elevating/relocating utility systems in the basement. Refurbishing abandoned buildings and turning them into emergency shelters was mentioned as a useful measure for increased protection of resident safety. A specific comment was made about the need for the *Resilient Bridgeport* project to effectively address the issues of sanitary sewer system problems and the related pumping station concerns.

Additional strategies shared include raising impediments to reduce water damage and improving safety measures such as using sandbags and implementing immediate post-disaster clean-up. Other comments focus on the importance of developing evacuation logistics that could work for those in need. These comments entail suggestions that include: (1) unambiguously communicating an evacuation alert or order; (2) effectively utilizing social media to make people aware of and share the evacuation plan; (3) providing easy access to the evacuation plan and shelter information through various communication channels; (4) extending aids to those who need special assistance for evacuation (e.g., elderly); and (5) reducing obstacles for evacuation such as providing transportation for those who need it and equipping emergency shelters to accommodate those who wish to evacuate with their family pets.

### 3.1.5 Motivations and Barriers

Participants suggested a set of strategies that could help motivate residents to support flood-risk adaptation/mitigation project planning. These include the necessity of “going into the communities” to solicit input and insights from community members as well as passing along relatable adaptation/mitigation planning information as the basis to pique the interest of and make an emotional connection with community members. Another participant emphasized the importance of mobilizing residents to attend public hearings and similar public events relevant to resilience planning. One participant advocates the need for long-term planning that aims at adaptation by embracing the ocean rather than fearing it; the same participant also believed that it is necessary to set sight on developing creative mitigation solutions without being overly concerned with money and resources during the development stage. Another policy suggestion entails the installation of a “*community advocate*” for the neighborhood by the City, with the expectation that this “*community advocate*” will objectively evaluate and advocate for the needs of residents/stakeholders in resilience project planning, mitigation project implementation and post-disaster recovery. The key message here appears to reflect that the adoption of a community-centered approach to address the

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resilience need could serve as a strong motivator to rally community support for planning adaptation/mitigation projects.

At the other end of the spectrum, participants cited a litany of reasons for why community support for adaptation/mitigation projects could be difficult to obtain. These reasons generally fall into four categories. First, aversion to government intervention was mentioned as a factor for people to avoid getting involved with these projects; in other words, distrust in government prevents people from participating in projects that could benefit them. Second, lack of understanding of these resilience projects or not having their voices heard to help shape project planning was cited as another barrier. Third, a lack of preparedness mentality, which leads to a failure of considering the need for resilience planning – until after the flood-induced damage has occurred – was indicated as another obstacle. This type of inertia was also described by one participant as a reflection of a “cultural” issue, which is characterized by resistance to acknowledge scientific data and the flood-risk threat. Fourth, community members feel that their views are often ignored, when their input on selected design elements associated with a proposed adaptation/mitigation project plan disagrees with the opinion of the “experts and technocrats” affiliated with the project. This particular view also reflects at least one participant’s feeling that, policymakers, architects, engineers and experts “don’t have to live with the consequences” of project planning, unlike those who physically reside in the community.

### **3.1.6 Potential Policy Options**

Most participants view the hypothetical parcel tax on property owners unfavorably and their reasons for not supporting this type of parcel tax are as follows. First, participants believe that the tax burden on property owners is already too heavy for the community and CT residents in general. Second, participant trust in the local government’s ability to effectively manage the tax dollars with accountability and avoid financial mismanagement is low. Third, participants believed that bonding is a good policy and taxing is generally a bad idea. A more moderate view toward this hypothetical tax policy was offered by several participants as well. This view primarily conveys the following considerations. First, a parcel tax policy could be acceptable, if the tax system is progressive in nature and takes a property owner’s income into account. Second, if enough CT communities choose to opt in, then this parcel tax policy could be viable, due to its short duration mandate. Third, greater resource sharing among coastal communities could reduce the tax burden for all.

### **3.1.7 Summary Analysis**

Consistent with the Fairfield participants, Bridgeport participants would like to see the communication about flood risk to be more intuitive, relevant and less confusing. In particular, they suggested that government agencies and scientists should update and improve the terminology used to explain flood risk to the general public. Ideally, members of the public could easily comprehend the concept behind the terminology and apply its meaning to evaluate their personal and community flood risk. Participants who experienced flood damage afflicted by *Hurricane Sandy* expressed a high degree of on-going fear, anxiety, dread and helplessness. These feelings are accompanied by the concern with their inability to

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overcome their food risk, due to resource limitations and the constant worries of the damage from a heavy rainfall.

Most participants possess a relatively proficient level of knowledge about basic preparedness and mitigation strategies that could reduce flood and erosion risk. They are aware of the need to communicate the logistics associated with an evacuation plan –with the emergency management personnel and other relevant parties – to facilitate a successful emergency evacuation. The key motivators and barriers relevant to their support for resilience planning evolve around connecting and communicating with community members to understand and address their concerns. With regard to the hypothetical parcel tax policy, while most participants believed that it is undesirable to add more tax burden to property owners, a minority considered the policy potentially feasible via sharing the tax burden across CT’s coastal communities.

### **B. BRIDGEPORT SURVEY FINDINGS**

In total, 301 valid survey responses were gathered from the residents and stakeholders targeted in the City of Bridgeport. The answer category “Refused to Answer” was provided for each survey item; the answer category of “Don’t Know Enough to comment” or “Not Applicable” was included with the survey items, whenever appropriate. All three answer categories were treated as “missing values” in the data and not computed for the report provided below.

To summarize the large amount of survey findings, the same 21 different conceptual clusters identified for the Fairfield study are explicated below.

#### **3.2.1 Resident Characteristics**

Respondents to this survey have very high home ownership, with 81.7% reporting owning a residential home and another 15% renting a home full time. The average number of residents in a household is 3.01 ( $SD = 1.08$ ); 69.5% of these households have at least one dependent child. On average, respondents have lived in Bridgeport for 18.5 years; 85.4% of them are employed full-time and another 10.3% employed part-time. The average age of these respondents is 39.2 years old ( $SD = 1.69$ ). While their median household income is about \$80,000 annually, 89.7% of the respondents have at least a four-year college degree. Of all respondents, 70.1% are males and 29.9% are females.

The current sample’s gender ratio is not comparable to that of the 2017 U.S. census data for the City of Bridgeport, which reports a gender ratio of 51.1% female to 58.9% male for adults. In terms of race and ethnicity, the current sample shows that 76% of the respondents are White, 12% Black/African American, 6% Hispanic, 4.3% Asian, 1.3%, Native Americans, and 0.3% mixed race. Compared to the single-race census data, except for the Hispanic group (6%), other racial categories are not well represented in the current sample. Specifically, the census data shows that Black/African Americans (35.3%), other race (16%)

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and two or more race (4.6%) were underrepresented in the current study sample, while Whites (40.4%) and Asians (3.1%) were overrepresented.<sup>21</sup>

Based on the findings of a systematic literature review that examines response rates for survey research of multiple ethnicities with mixed methods (excluding face-to-face interviews and mail survey only), the African American response rate was 15.4% with a college student sample.<sup>22</sup> This 15.4% response rate from a college student population is the closest available data point that could be compared to the slightly lower 12% response rate from the general Black/African American population for the current project. The Pew Research Center, likewise, reported the lowest telephone survey response rate from Black respondents, which is benchmarked around 10%; Pew Research's own response rate from this racial group is below 10%.<sup>23</sup> This low response rate from Black and African Americans thus constitutes a study limitation.

### 3.2.2 Property Damage

Nearly 70% of the respondents (68.8%) reported that their property had suffered damage caused by *Hurricane Sandy* and 14% experienced similar damage on their property located elsewhere due to other storms. While just over one-fifth of all respondents (21.6%) mentioned that their property was affected by recent flood events with on-going damage, 60.8% indicated the same without any on-going damage. A majority of the respondents (61.7%) mentioned the need for more repair of their homes to fend off heavy rain. Likewise, a very high percentage (69.7%) of the respondents indicated an increase in maintenance costs for keeping their property safe.

Based on these findings, it is clear that a vast majority of the respondents have sustained property damage due to *Hurricane Sandy*; and most of their homes also require more repair which accrues additional long-term financial burden for property maintenance. Of all respondents, 14% indicated that they would consider relocating to another city to avoid having flood damage to their homes in the next three years. This mobility trend, if it is primarily driven by past flood damage and/or on-going flood risk concern, does not bode well with the long-term economic development of the region.

### 3.2.3 Economic Impact

Respondents were instructed to evaluate the on-going negative economic effects on their property, household and the community, due to past flood events. Results below report the

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<sup>21</sup> United States Census Bureau, Retrieved from <https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=CF>

<sup>22</sup> Sykes, L. S., R. L., Walker, Ngwakongwi, E., Quan, H. (2010). A systematic literature review on response rates across racial and ethnic populations. *Canadian Journal of Public Health*, 101(3), 213-219.

<sup>23</sup> Keeter, S., Hatley, N., , C., & and Lau, A. (2017, May 15). What low response rates mean for telephone surveys. Retrieved from <https://www.pewresearch.org/methods/2017/05/15/what-low-response-rates-mean-for-telephone-surveys/>

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percentage of respondents who *agree* or *strongly agree* with the *negative economic effects* on each of the following items.

- one's own property value: 78.23%
- the property value of neighboring streets: 69.1%
- the property value in the community in general: 88.6%
- one's own household: 59.8%
- the financial resources of the community: 76.6%
- the cost of maintaining public infrastructure in the community: 78.4%
- the taxpayers' burden in the community: 89%
- small businesses in the community: 76.3%
- large companies in the community: 78.8%

Respondents were further queried about the status of their property insurance premium in relation to past flood events. An increase in insurance premiums was mentioned by 61.5% of the respondents. As 73.3% of the respondents reported that their property insurance premiums have become very costly, 69.7% lamented that these premiums have become unaffordable.

In no uncertain terms, a vast majority of the respondents believed that their property value, financial resources, tax burden and the businesses in their community were adversely affected by past flood events. They are concerned with the financial resources of their own households and the community as well as the cost of maintaining the infrastructure in the community. As over 70% of the respondents feel that their property insurance premiums are either too costly or unaffordable, this financial burden is yet another negative economic effect inflicted by the recurring flood damage in this community.

### 3.2.4 Risk Severity and Vulnerability

Respondents were asked to describe the degree of risk – related to the perceived severity of flood, erosion and storm surge – to which their property and the properties in their neighborhood is exposed. Results presented below detail the percentage of respondents who consider the severity of their risk be *negligible*, *mild/moderate* or *severe/critical*.

- Exposure to flood risk on one's own property: negligible (1.3%); mild/moderate (76.3%); severe/critical (22.3%)
- Exposure to flood risk in the neighborhood: negligible (1%); mild/moderate (44.5%); severe/critical (44.5%)
- Exposure to flood-induced erosion on one's own property: negligible (3%); mild/moderate (67.8%); severe/critical (29.3%)
- Exposure to flood-induce erosion risk in the neighborhood: negligible (1.7%); mild/moderate (57%); severe/critical (41.3%)

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- Exposure to the impact of storm surge on one's own property: negligible (1.7%); mild/moderate (72%); severe/critical (26.3%)
- Exposure to the impact of storm surge in the neighborhood: negligible (1%); mild/moderate (50.3%); severe/critical (48.7%)

Next, respondents were asked to describe the vulnerability they feel toward the potential occurrence of another Sandy-like superstorm. The description below details the percentage of respondents that either *agree* or *strongly agree* with each aspect of this vulnerability sentiment, if a future flood strikes the community during a *Sandy*-like superstorm.

- Afraid for your personal physical safety: 56.7%
- Fearful for potential damage to your home: 68.7%
- Worried about potential damage around your property: 78.1%
- Anxious about potential need for evacuation: 58.7%
- Concerned about potential financial losses: 78.1%

The results shown above reveal an astonishingly high percentage (97% - 99%) of the respondents reported that their risk exposure to flood, erosion and storm surge ranges from mild to critical. When asked to assess their perceived vulnerability to the element, while a majority of the respondents were fearful for their personal safety, at least nearly 70% of all respondents were concerned with property damage and financial losses. These findings reveal a community that feels highly vulnerable due to the severity of the threat against their personal property, financial asset and personal well-being. This sense of vulnerability also draws from the fear of having to endure another flood event triggered by a *Sandy*-like superstorm in the future.

### 3.2.5 Mitigation Effectiveness Evaluation

A list of commonly proposed mitigation strategies was presented to respondent to explore their beliefs about the effectiveness of these strategies. Results reported below describe the percentage of respondents who feel *confident* or *very confident* with each mitigation strategy presented.

- Raising levees: 71.8%
- Deepening river channels: 71.2%
- Improving the storm water network: 72.2%
- Building structures such as ripraps, revetments or bulkheads: 67.1%
- Moving houses away from high-risk areas: 65%
- Increasing natural buffers like tidal wetlands, salt marshes and ponds: 73.5%
- Laying natural barriers such as dunes or intertidal flats: 74.5%
- Constructing flood walls: 76%
- Modifying buildings (e.g. raise floor levels and utility services; fill in basement, if permitted by zoning): 72.4%
- Restricting new buildings or renovations in areas with high flood risk: 75.6%

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Based on these findings, it appears that about two-thirds of the respondents have confidence in the ability of built structures such as ripraps, revetments or bulkheads – as well as moving houses away from high-risk areas – as effective mitigation measures. This compares to at least 72% of all respondents who feel confident with the remaining mitigation strategies that involve the construction of other types of physical structures (e.g., building flood walls), re-engineering of infrastructure (e.g., raising levees), living shoreline solutions (e.g., adding dunes and tidal wetlands) and modifying existing buildings (e.g., raising floor levels), in addition to restricting new buildings or building renovation in high risk areas.

These findings suggest that there is little differentiation in respondent beliefs about the effectiveness of the array of mitigation strategies presented to them. It is highly likely that, as nearly 70% of these respondents experienced damage from *Hurricane Sandy* and at least 97% of them believed that their property is subject to mild to critical flood risk, they are willing to support all types of natural or engineered mitigation solutions that could help safeguard their homes, neighborhood and the quality of life in their water-front community.

### 3.2.6 Mitigation Barriers

An assessment of respondent beliefs about the factors that may obstruct the success in reducing flood risk for residential homes was advanced. Results shown below describe the percentage of respondents who either *agree* or *strongly agree* with the statements that reflect the barriers against reducing flood risk in residential homes.

- The costs for flood management are too high: 55.9%
- Special skills are required to know how to manage flood risk: 77.4%
- Special information is required to know what flood-risk management involves: 74.6%
- Other priorities can outrank the need to manage flood risk: 55.3%
- Don't believe that serious flood will occur in the foreseeable future: 47.5%
- Floods don't happen often enough to make flood-risk management a high priority: 61.6%
- The information about flood risk is not reliable: 44.3%
- Flood-risk management may not be enough to reduce the risk: 56.6%
- Managing flood risk is too challenging to achieve: 42.7%
- Those who live in the flood plan don't care enough about their flood risk: 49%
- Don't want taxes to go up to help pay for flood-risk management: 54.6%
- Don't want any flood management construction to block the view from residential property: 56%
- Those who are not exposed to flood risk don't care: 79.9%

The mitigation barrier chosen by the vast majority (80%) of respondent is perceived apathy from those not at risk for flooding, followed by perceived lack of required mitigation skills and information. Other barriers considered by at least more than half of all responds are related to

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practical reasons such as financial cost, potential tax increases, uncertainty of mitigation effectiveness and flood risk not being a top priority. The percentage of respondents who consider the following reasons as barriers – including not believing the reliability of the flood-risk information or the seriousness of flood risk in the near term as well as perceived powerlessness over flood-risk management – range between 42% to just under 50%.

By implication, a large majority of the respondents believed that the major barriers to reducing flood risk have to do with the missing support from those community members not at risk for flooding and a lack of access to the necessary information and skills for practicing flood-risk mitigation. These are followed by other potential barriers ranging from financial factors and doubts of mitigation effectiveness to perceived challenge of flood-risk management. Overall, perceived barriers that may interfere with reducing flood risk to residential homes in the community seem to be relatively “stubborn” for most to overcome.

### 3.2.7 Mitigation Motivations

In contrast to mitigation barriers, a set of questions that explores the key motivations for property owners to support flood-risk management planning was advanced. The results below represent the proportion of respondents who answered “yes” to each motivation measure.

- your property was flooded before: 74%
- you live in a floodplain: 45.6%
- you want to protect your property value: 54.7%
- you live near a floodplain: 65.3%
- your property may be at risk for future flooding: 62.5%
- your taxes may go up, if flood-risk management is not implemented: 57.5%

The most important motivation supporting flood mitigation, as perceived by respondents, is if one’s property was flooded before. This is followed by perceived flood risk factors and tax-burden consideration. Interestingly, living in a flood plain was selected by the lowest number of respondents as a motivation for individuals to support flood-risk mitigation. It is possible that some respondents who live in a floodplain (but without flood experience) could develop the cognition of “wishful thinking,” “self-denial” or even “fatalism,” when faced with the thought of a potential flood risk. If true, this type of thought pattern is a form of maladaptive response to threat, which could lead to risk avoidance and lack of motivation to support flood-risk management planning.<sup>24</sup> Furthermore, somewhere between having been (or not having been) impacted by a flood event are those “anxiety” factors – related to one’s concern with flood risk and financial burden – that appear to be moderate motivators for considering mitigation actions.

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<sup>24</sup> Babicky, P & Seebauer, S. (2019). Unpacking protection motivation theory: Evidence for a separate protective and non-protective route in private flood mitigation behavior, *Journal of Risk Research*, Retrieved from <https://doi.org/10.1080/13669877.2018.1485175>

### 3.2.8 Self-Efficacy for Mitigation

Respondent beliefs about their ability to engage in mitigation activity were investigated. In particular, a set of questions that examine their confidence level in taking the following actions to reduce flood risk was posed to them. Results reported below describe the percentage of respondents who feel *confident* or *very confident* with each potential requisite action.

- Try to come up with a strategy about what to do: 51.1%
- Construct an actual plan of action: 68.9%
- Have enough financial resources to implement your plan (e.g., a flood-risk reduction project): 69.6%
- Have enough support from (e.g., family and friends) to help you implement your plan: 53.6%
- Decide how you might best handle the problem (e.g., taking out a loan, as needed): 66.7%
- Carry out your action plan regardless of the difficulty: 62.3%

Even though at least 60% and 70% of the respondents mentioned that their household finances have been adversely affected and their insurance premiums have become unaffordable, respectively (see Sec 3.2.3), the vast majority of them (about 70%) still feel confident with having sufficient financial resources to implement their own flood-risk mitigation plan. It is possible that the respondents for the survey, based on their income and education level, represent the more economically secure residents in the city. These demographic characteristics, combined with respondents' risk beliefs and experience – evidenced by 97% reporting “mild-to-extremely severe exposure” to flood risk and nearly 70% having sustained flood damage (see Sec 3.2.4) – may explain their confidence in finding the necessary financial resources to reduce their personal flood risk. This type of confidence, even if it is born out of necessity, exhibits exactly the type of efficacy that is much needed for individual property owners to establish their resilience against the flood risk they face.

It is worth noting that a comparable percentage of respondents from Bridgeport (53.6%) and Fairfield (56%) reported having sufficient confidence in carrying out risk-reduction plans with the help of their social network (e.g., family and friends). On the one hand, it is comforting to know that social network may provide the necessary social capital for individuals to access in time of need. On the other hand, while such social capital is valuable, it may not be accessible on demand or sufficient to stare down the potentially insurmountable threat of an impending flood. For this reason, it is important to again explore the collective community efficacy – which remains the most accessible social capital for establishing community resilience – due to its communal and physical proximity.

### 3.2.9 Collective Efficacy for Mitigation

Respondent beliefs about their ability to engage in mitigation activity collectively with others in the community were examined. A series of questions that queries their confidence level in collaborating with others to reduce flood risk was presented. Results shown below describe the

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percentage of respondents who feel *confident* or *very confident* in their ability to work with other community members to develop flood-risk management plans.

- work with others to develop community-based solutions: 48.4%
- participate in local activities or events that educate residents about flood risks: 56.9%
- contribute money to local events that promote flood risk management: 59.5%
- contribute food to local events that promote flood risk management: 51.4%
- participate in public meetings to offer feedback on flood-risk management plans: 57.8%
- attend public workshops to participate in flood-risk management planning: 65.8%

These findings show that Bridgeport respondents are at least twice to three times more confident in their ability to connect and collaborate with neighbors and stakeholders to work toward building social resilience against the flood risk that threatens their community, compared to Fairfield respondents. This gap in perceived social capital within one's community – which could be tapped for collectively achieving a common goal of building social resilience – might have been a function of practical and logistical reasons described below.

Bridgeport is an urban community where people live in closer proximity to each other and many reside in multiple dwelling units. The devastation brought by *Hurricane Sandy* heavily concentrated in Bridgeport's *South End* neighborhood, with nearly 70% of the respondents from this neighborhood suffering from flood damage. By contrast, only about 32% of Fairfield respondents reported property damage due to *Sandy*; this is because they reside in three contiguous districts that are geographically different in their flood-risk level. As such, the perceived need and feasibility for working with one's neighbor and community members to solve flood and erosion problems seems more pressing for Bridgeport than Fairfield respondents. In addition, the *Resilient Bridgeport* project, which has invested dedicated resources to conduct community outreach, could have played a prominent role in illuminating the importance of collaboration between residents and stakeholders. In particular, the project has conducted regular public hearings, meetings, walking tours and design workshops that congregate South End residents and stakeholders as well as project managers, designers and engineers together – to dialogue about confronting the flood and erosion challenge – with the collective wisdom, effort, determination and perseverance of the community.

### 3.2.10 Institutional Efficacy for Mitigation

Respondent beliefs about the ability of institutions to address community mitigation needs and to reduce community flood risk were also measured. A comprehensive list of institutions, including news media and the science community, were included in the measurement. Results shown below describe the percentage of respondents who feel *confident* or *very confident* in the ability of these institutional players in helping to reduce community flood risk.

- municipal government that responds to the needs of its residents: 63.9%
- community leaders that organize the residents to contribute to local flood-risk management: 59.4%

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- scientists and engineers that provide assessments of the actual flood risk: 67.5%
- government agencies that could implement flood-risk management plans: 62.2%
- news media that report the flood risk: 49.5%
- the City Council or its equivalent that speaks for the people they represent: 64.7%
- the local law enforcement that protects the safety of your community: 63.6%
- the state law enforcement that protects the safety of your community: 64.8%
- the federal law enforcement that protects the safety your community: 77.5%

Findings show that between nearly two-thirds and just over three-quarters of Bridgeport respondents expressed confidence in the ability of different institutions to help reduce flood risk in their community. Respondents also express moderate and moderately strong confidence in news media and community leaders and news media as the entities that could address community mitigation needs, respectively. The institutions that received the largest vote of confidence in the Bridgeport sample are federal law enforcement (77.5%) and scientists/engineers (67.5%); scientists/ engineers (57.6%) and local law enforcement (53.1%) were chosen for the same reason by the Fairfield sample. This validation of the role of scientists and engineers could perhaps be explained by the education level of the survey respondents, which reflects an overwhelming majority of college educated individuals.

Perceived confidence in news media was much stronger among Bridgeport respondents (49.5%) than Fairfield (26.4%). Even so, between a quarter and half of all respondents to this project consider news media an institution for facilitating flood-risk reduction. Meteorologists that provide weather-related news for a media outlet (dubbed as the “station scientists”)<sup>25</sup> also present scientific information related to weather events and the climate in a manner accessible to the general public

The primary functions of news media are to disseminate severe weather advisories/warnings and updates as well as information about preparedness, emergency evacuation and recovery resources. They do contribute to directly and indirectly helping the public to reduce the threat of their flood risk.

### **3.2.11 Mitigation and Preparedness Action**

To assess whether property owners took up any mitigation action on their own to reduce their flood, erosion and storm surge damage, a list of questions was posed to them. Results detailed below describe the percentage of respondents indicating that they have implemented each of the following mitigation measures.

- Raised the foundation of their property: 54.8%
- Have kept ditches and drains around the property clean: 53.8%

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<sup>25</sup> American Meteorological Society. The Station Scientist Initiative, Retrieved from <https://www.ametsoc.org/index.cfm/ams/information-for/professionals/station-scientist-initiative/>

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- Have raised electrical outlets and switches: 53.8%
- Have made a plan about what to do, if a flood is threatening (e.g., evacuation): 60.5%
- Have compiled a disaster preparedness kit (e.g., first-aid kit, blankets, pet carrier): 55.5%
- Have stocked up on emergency survival items (e.g., canned goods, flashlights, batteries): 51.2%

These results reveal that at least half of all respondents have engaged in selected preparedness actions through making plans to adapt to a potential flooding event. A similar proportion of respondents also reported having adopted selected mitigation actions presented above. These findings suggest that the need to increase the practice of preparedness and mitigation against flood risk among property owners remains imminent, as approximately 40%-50% have opted for doing nothing to protect themselves or their properties.

### 3.2.12 Risk-Management Responsibility

Respondents were also asked to share their beliefs about who should be responsible for managing flood risk in their community. Results described below indicate the percentage of respondents who *agree* or *strongly agree* with the parties that are responsible.

- Those who own properties in the floodplain in your community: 79.7%
- Those who own properties that were affected by floods in your community: 62.2%
- Those who live in your community (municipality): 72.3%
- Residents that are exposed to flood risk in your region: 74.1%
- Residents that are exposed to flood risk in Connecticut's coastal communities: 69.6%
- Residents who live in Connecticut's coastal communities: 75%
- Residents who live in the State of Connecticut: 71.4%
- Taxpayers in the country: 71.2%

These findings demonstrate a relatively uniform response toward the parties that are considered to be responsible for flood-risk management for both the Bridgeport and Fairfield sample, except for two indicators. These two indicators reflect that 71.4% and 71/2% of Bridgeport respondents consider the CT residents and U.S. taxpayers responsible for managing their local flood-risk, respectively, compared to 38.6% and 35.5% for Fairfield respondents in the same order. It is possible that as two to three times more Bridgeport respondents than Fairfield respondents believe in building collective community efficacy to battle against the flood/erosion challenge (see Sec 3.2.9), this suggests that most Bridgeport respondents may also believe that their localized flood risk is a socioeconomic concern for the nation as a whole. In other words, local community resilience has implication for regional and national resilience.

### 3.2.13 Share of Responsibility

Addressing the concept of who should be responsible for mitigating flood risk in their community from another dimension, respondents were requested to evaluate the perceived

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importance of each of the following parties in local flood-risk management. Results below describe the percentage of respondents who consider a given party as being *important* or *absolutely important* in managing local flood-risk concerns.

- Federal Government: 74.7%
- State Government: 77.2%
- Municipal Government: 81.3% important/absolutely important
- Community groups: 79.2% important/absolutely important
- Neighborhood associations: 76.6%
- Individual residents: 88.6%

According to the results, the largest proportion of respondents believe that individual residents are the most important driver in flood-risk management, followed by the municipal government and community groups. By comparison, while the largest percentage of Fairfield respondents consider local municipalities as the important party in driving flood-risk management, the smallest percentage of them deem community groups as the least important entity. The contrast between Bridgeport and Fairfield respondents could perhaps be explained by the strong belief about collective community commitment as the basis for building community resilience of the former, which is not widely shared by the latter.

### 3.2.14 Risk Anticipation and Decision-Making Style

To further understand how respondents may think about and respond to the concept of flood-risk management, their beliefs associated with when the next severe weather event similar to *Hurricane Sandy* may materialize were also assessed.

Results below reveal that a mid-50% range of respondents anticipate the next superstorm to arrive between 1-20 years. That percentage goes up from 70% to just over 80%, when respondents project the next severe weather event to appear between 20-50 years. Not unlike the Fairfield survey results, nearly half of all Bridgeport respondents don't consider a severe storm or hurricane would occur in the near term. Wishful thinking or not, it is going to be 7 years since *Hurricane Sandy* struck both communities in 2012.

- within the next 1 - 5 years: 57.3%
- within the next 5 -10 years: 54.2%
- within the next 10 - 20 years: 55%
- within the next 20 - 30 years: 69.9%
- within the next 30 - 40 years: 67%
- within the next 40 - 50 years: 80.5%

To further investigate an individual's decision-making style when it comes to managing their risk-taking (or maximizing the probability for receiving a gain) vs. risk-avoidance (or minimizing the probability for receiving a loss) behavioral tendency, a set of measures below

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were developed to test how individuals may weigh their risk to increase their potential gain and decrease their potential loss. was included in the survey.<sup>26</sup>

Two options below were presented for respondents to determine their risk tolerance level. As demonstrated below, findings appear to contradict the anticipated human tendency of minimizing risk-seeking (Binomial test,  $p = .011$ , 2-tailed), showing that Option A is significantly more preferred over Option B. Additional analyses were conducted to determine whether respondents who experienced property damage from *Hurricane Sandy* (68.8%) or past flood events (82.4%) may differ in their response; no significant statistical difference (Kruskal-Wallis Test  $>.05$ ).

- Option A: There is an 80% chance that you will save an extra \$1,000 in flood damage repair: 57.6%
- Option B: There is a 100% chance that you will save an extra \$700 in flood damage repair: 42.4%

Another two options were presented for respondents to determine their risk avoidance level. The findings below did not validate the human tendency of maximizing risk-avoidance (Binomial test,  $p < .001$ , 2-tailed), as Option B is shown to be significantly preferred over Option A. Additional analyses were completed to explore whether respondents who experienced property damage from *Hurricane Sandy* (68.8%) or past flood events (82.4%) may differ in their preference, Again, no significant statistical difference was found (Kruskal-Wallis Test  $>.05$ ).

- Option A: There is an 80% chance that you will lose an extra \$1,000 in flood damage repair: 37.7%
- Option B: There is a 100% chance that you will lose an extra \$700 in flood damage repair: 62.3%

While these findings diverge from those reported for the Fairfield sample, they are highly significant from the perspective of understanding alternative decision-making approaches.

For example, nearly 70% of the Bridgeport respondents reported having sustained flood damage from *Hurricane Sandy*, but only 32% of Fairfield respondents stated the same. By implication, Bridgeport respondents may be more willing to take a measured or calculated risk on the hypothetical financial gain or loss related to flood-damage repair – as presented in the two pairs of gain vs. loss scenarios – than Fairfield respondents. Another plausible explanation for this discrepancy in risk-taking or risk-avoidance tendency between the Fairfield and Bridgeport respondents could be related to the following factors.

First, the demographic composition of the Fairfield sample closely approximates the Town's census, while the same is not true with the Bridgeport sample. Second, while the Fairfield sample was drawn from a much larger geographic region and contains residents who face divergent levels of flood/erosion risk, the Bridgeport sample was made up of residents in the South End area whose flood/erosion risk level is relatively similar. Based on these two reasons, and the fact that nearly 99% of the Bridgeport sample vs. 71% of the Fairfield sample believed that their

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<sup>26</sup> Kahneman, D., & Tversky, A. (1979). Prospect Theory: An Analysis of Decision under Risk. *Econometrica*, 47(2), 263-291.

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property is at risk for flooding, their perceived personal risk may moderate the results of the risk-seeking and risk-avoidance tendencies exhibited herein.

### 3.2.15 Flood-Risk Information Dissemination

Turning to the challenge of how best to reach coastal residents with flood-risk forecast and warning, a set of communication channels was evaluated by the respondents. Respondents were asked to report how often they receive flood-risk inform from each of the information sources below, when a severe storm is looming on the horizon. Results reported here describe the percentage of respondents who *often* or *very often* receive flood-risk inform from each source.

- Weather forecast in a printed newspaper: 40%
- Weather forecast on a radio station: 52.3%
- Weather forecast on a TV station: 66.8%
- The Weather Channel on Cable TV: 50.2%
- Cable news networks such as CNN, MSNBC or Fox: 54.6%
- Web portals such as Yahoo.com, MSN.com or Google.com: 46.2%
- Local news outlets on the Internet, e.g., a local newspaper, radio station or TV station: 63.6%
- Major national news outlets on the Internet, e.g., USA Today, CNN, MSNBC or Fox: 58.9%
- Facebook, a social media outlet: 46.5%
- YouTube, a social media outlet: 45.7%
- Twitter, a social media outlet: 45.2%
- Instagram, a social media outlet: 39.6%
- Reddit, a social media outlet: 40.2%
- Snapchat, a social media outlet: 43.3%
- Other social media outlets, such as Snapchat, Tumblr or WhatsApp: 34.5%
- Mobile phone applications, e.g., a weather forecast app: 64.4%
- CT Alerts, a mobile app from the state's Emergency Alerting and Information System: 52.9%
- A newsletter through an email account: 44.5%
- A family member: 59.2%
- A relative: 52.2%
- A friend: 48.3%
- A neighbor: 66.9%

Interestingly, one's neighbor is considered the most frequent flood-risk information source (at 67%) for Bridgeport respondents, which is nearly doubled the percentage (34%) for Fairfield respondents. While weather applications for mobile phones are a close second (64.4%) as an information source, they are the most prevalent source (62.8%) for Fairfield residents. Other

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more frequently mentioned information sources include the old standbys such as weather forecast on a TV station, local news outlets on the Internet. CT Alerts, other major national news media and weather news outlets on television and the Internet as well as a family member or a relative. The least utilized information sources remain to be online media outlets that are not conventionally associated with risk information dissemination; these resources include web portal service such as Yahoo and the various commonly used social media platforms.

The percentage of Bridgeport respondents who reportedly receive flood-risk information through social media platforms is twice to ten times higher than that of Fairfield respondents, with Facebook being the most mentioned source (46.57%), followed closely by YouTube (45.7%) and Twitter (45.2%). It is possible that Bridgeport respondents stay in touch or share information with their neighbors, family members, relatives or other members in their community (e.g., fellow churchgoers) through social media outlets more often than their Fairfield counterparts.

### 3.2.16 Potential Policy Options

Respondents were introduced to a parcel tax policy that has been implemented in nine counties of the San Fran Bay area, as an example of community-based funding option for implementing flood-risk mitigation in coastal communities. They were then separately presented with two series of questions targeting coastal communities vs. local community (municipality) as the hypothetical taxing unit, in addition to the preferred dollar amount for the hypothetical tax.

#### *Coastal Community Parcel Tax Policy*

The first question asks whether a proposal that collects an annual parcel tax (independent of property value) in CT's coastal communities for the next 20 years to help fund flood-risk management plans would receive enough support from their household and property owners in different locales within these communities. Results reported below depict the percentage of respondents who perceive whether such a parcel tax will receive *support* from each household or property owner type.

- Your household: 91.6%
- property owners on your neighborhood: 47.1%
- property owners in your municipality: 56.1%
- property owners in the most at-risk coastal communities on Long Island Sound: 75.2%
- property owners in the coastal communities on Long Island Sound: 46.9%

A second question asks whether this annual parcel tax collected in CT's coastal communities should be designated as a flat fee or a prorated fee. The following results display the percentage of respondents who *support* each type of hypothetical fee option.

- a flat fee for all residential property owners: 80.1%
- a flat fee for non-residential properties, including commercial and non-commercial properties: 40.2%
- the same flat fee for both residential and non-residential properties: 38.9%

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- a prorated fee based on the parcel size of the property: 66.4%
- a prorated fee based on the proximity of the property to the floodplain: 50.2%
- a prorated fee based on the income level of the parcel owner: 50.5%

The third question asks how much this parcel tax should be, if it is designated as a flat fee and collected annually in CT's coastal communities. Results below show the percentage of respondents who chose to *support* each hypothetical tax rate option.

- \$20 per year or 5.5¢ per day: 69.4%
- \$30 per year or 8.2¢ per day: 41.2%
- \$40 per year or 11.0¢ per day: 39.3%
- \$50 per year or 13.7¢ per day: 37.5%
- \$75 per year or 20.6¢ per day: 18.3%

### *Municipal Parcel Tax Policy*

The first question inquires whether this parcel tax policy will receive support from the respondents themselves and the property owners in their community, if their local municipality independently proposes this annual parcel tax. Results reported below indicate the percentage of respondents who perceive whether such a parcel tax will receive *support* from each household or property owner type.

- Your household: 92.6%
- property owners on your neighborhood: 49.7%
- property owners in your community (or your municipality): 64.7%

The next question asks whether this annual parcel tax, if collected in their community by their local municipality, should be designated as a flat fee or a prorated fee. Results below reflect the percentage of respondents who chose to *support* each hypothetical fee option.

- a flat fee for all residential property owners: 82.1%
- a flat fee for nonresidential properties, including commercial and noncommercial properties: 40.2%
- the same flat fee for both residential and nonresidential a prorated fee based on the parcel size of the property: 42.9%
- a prorated fee based on the proximity of the property to the floodplain: 60.5%
- a prorated fee based on the income level of the parcel owner: 41.2%

A third question asks how much this parcel tax should be, if it is designated as a flat fee and collected annually in their community by the local municipality. Results below reveal the percentage of respondents who chose to *support* each hypothetical tax rate option.

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- \$20 per year or 5.5¢ per day: 57.1%
- \$30 per year or 8.2¢ per day: 45.5%
- \$40 per year or 11.0¢ per day: 45.8%
- \$50 per year or 13.7¢ per day: 35.5%
- \$75 per year or 20.6¢ per day: 24.9%

About 92% of the respondents reported that their own household will support a parcel tax policy and three-quarters of the respondents also stated the same for property owners located in the most at-risk areas of the Long Island Sound; these results are similar to those reported by the Fairfield sample. Twice as many respondents in Bridgeport, relative to Fairfield consider that this parcel tax should be a flat fee for all, as most Fairfield respondents support a prorated fee based on proximity of the property to a floodplain. As for the preferred parcel fee amount that should be collected, a similar (largest) proportion of respondents from both communities would be willing to pay \$20 annually. Whether the hypothetical tax policy is assumed to be implemented at a municipal level or across CT's coastal communities, results don't diverge between the two samples.

Several findings reported by the Bridgeport respondents here could have potential policy implications. First, more than 90% of the respondents would support the hypothetical parcel tax proposal to be collected across all coastal community residents or as a municipal tax on their property. Second, over 80% of the respondents prefer this tax be collected as a flat fee for all property owners, regardless whether the property is residential, commercial or institutional. Third, a hypothetical annual parcel tax of \$20 receives the most respondent support. Taken together, Bridgeport respondents, consistent with their expressed beliefs, are motivated to build social resilience with other community members (including residents, businesses and institutions) and are open to a parcel tax policy that benefits all in an equal manner.

### **3.2.17 Information and Activity Engagement**

An individual's storm preparation, risk mitigation and post-disaster recovery skills are often a function of whether coastal residents have engaged the relevant information and activities that could aid them to develop risk avoidance or reduction practices. To explore this phenomenon, respondents answered two sets of questions that inquire about their flood-risk information-seeking frequency at an individual and community level since *Hurricane Sandy*. Results reported below indicate the percentage of respondents who *often* or *very often* seek such information.

The first set of questions asks how often the respondent has sought information related to their flood risk for their own property. The results below show that between over one-quarter and just below 60% of all respondents reported having spent some time and effort in seeking different types of flood risk information.

- flood risk to your property: 28.1%
- flood risk to your neighborhood: 49.3%

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- flood risk to your community: 57.6%
- what to do to help manage a possible flood: 44.3%

Another set of questions inquires how often the respondent has sought to engage flood-risk management activities with other community members. The results reported below indicate that between 40%-56% of the respondents have ever consulted community groups or the municipal government to seek flood-risk related information.

- Become involved with a local community group focusing on flood management: 40.4%
- Communicated with the city hall about how to reduce flood risk on your property: 44.9%
- Participated in public meetings related to flood-risk management: 55.9%

Even though nearly 84.8% of the respondents have experienced a flood event before (see Sec 3.3.2), the percentage of them that sought information about the flood risk of their own property is low, compared to the percentage that sought flood-risk information about their neighborhood or the community. It is possible that these respondents are already highly familiar with their own flood risk but are curious about the flood risk of others, as the flood risk in the neighborhood or the community could adversely affect the value and other assets related to their own property. While at least 40% of the respondents have consulted others about how to reduce their flood risk, Bridgeport respondents' ability to lean on their community members again signifies a certain degree of social capital that is necessary for building long-term social resilience at the community level.

### **3.2.18 Communication about Flood-Risk Management Planning**

As demonstrated above, only a small number of respondents have been “pulled” to seek flood-risk related information for their own property. It is therefore necessary to know what types of flood-risk management information is considered important to them, in order to develop a “push” strategy to disseminate such information to them.

Respondents were invited to determine how important it is for them to receive communication about the different types of information related to flood-risk management planning in their community. Results provided below demonstrate the percentage of respondents who consider each entity as being *very important* or *absolutely important*.

- which entities are in charge: 83.9%
- which community groups representing the taxpayers are involved: 60.9%
- which projects will be planned: 71.4%
- which projects are being planned: 72.4%
- which projects will be implemented: 74.9%
- which projects are being implemented: 76%
- the costs of these projects: 72.1%

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- who is financially responsible for these projects: 79.3%
- what is the share of financial burden on taxpayers like you: 81.3%

Based on these results, it appears that the information about the entities in charge, taxpayer burden and financial responsibility associated with flood-risk management planning is considered important by the vast majority of respondents (79% - 83.9%). Likewise, perceived importance of receiving the different aspects of flood-risk management presented to them does not vary much (71.4%-76%). Even though perceived importance of community groups was reported by the lowest number of respondents (60.9%), a majority of the respondents still regard the role of community groups as essential in flood-risk management planning.

### 3.2.19 Communication about Flood-Risk Management Outcomes

Another set of questions was developed to describe how important it is for respondents to receive communication about the anticipated outcomes for flood-risk management planning in their community. Results below reflect the percentage of respondents who consider a specific outcome to be *important* or *absolutely important*.

- whether these plans will create a positive economic impact on your community: 43.1%
- whether these plans will influence the recreational opportunities in your community: 64.1%
- whether these plans will improve the quality of life in your community: 77.8%
- how these plans will affect your property: 57.5%
- how these plans will affect the properties in your neighborhood: 55.3%
- whether the scientific facts back up the rationale for making these plans: 79.3%

As nearly 80% of the respondents consider scientific facts as an important basis for determining flood-risk management outcomes and how such outcomes may improve their quality of life, these findings suggest that science is valued for its role in improving the environmental safety and lives in the community. The remaining results seem to suggest that quality of life precedes the importance of other aspects of flood-risk management outcomes.

### 3.2.20 Communication Channels for Engagement

Respondents were also asked to indicate what the best ways to communicate with them in order to engage them in flood-risk management planning in their community might be. Results presented below indicate the percentage of respondents that either *agree* or *strongly agree* with each of the following approaches being the best way to communicate with them.

- Invite you to enter your email address in a city registry to receive important announcements: 67.9%
- Invite you to enter your phone number in a city registry to receive important announcements: 68.4%

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- Invite you to attend Resilience Fair to enjoy food, games, activities and conversations about building a more resilient community with your friends, neighbors, and community members: 64.5%
- Invite you to form a “neighborhood group” to address neighborhood flood-risk concerns: 61.1%
- Invite you to participate in “resilient neighborhood” design workshops to help develop flood-risk management plans for your neighborhood: 68.9%
- Invite you to attend public meetings that address community-wide flood-risk concerns: 76.7%
- Invite you to attend “resilient community” design workshops to help develop flood-risk management plans for the community: 68.4%
- Invite your neighborhood group to work with other neighborhood groups in the community: 76.7%

Public gatherings including meetings for the community and between neighborhood groups are considered the best channels for engaging individuals for flood-risk management planning. Respondents also considered other venues such as public workshops, electronic registries (for receiving announcements) as well as other activities that combine social and engagement functions to be effective ways to communicate with them about flood-risk management.

### **3.2.21 Engaging the *Resilient Bridgeport* Project**

As a lead-in to assess community engagement with the *Resilient Bridgeport* (or “*RB*” hereafter) project, respondents were first asked whether they have heard of this project before. The answer to this question indicates that 86.7% have heard of the *RB* project.

A series of follow-up questions then gauges respondent interest in engaging the *RB* project or their neighbors to learn about or participate in flood-risk management planning in their community. Results below demonstrate the percentage of respondents indicating that they are *interested*, *very interested* or *extremely interested* in such engagement opportunities.

- Visit the *RB* project website to learn about flood-risk management: 85.4%
- Ask question about flood-risk management by contacting the *RB* project: 86.7%
- Offer your input about flood-risk management by contacting the *RB* project: 84.7%
- Attending the forthcoming public meetings held by the *RB* project: 66%
- Attend the upcoming community workshops/presentations held by the *RB* project: 84.4%
- Participate in a “neighborhood group” to address flood-risk concerns in your neighborhood: 89.7%

As described above, at least about 85% of all respondents are interested in engaging the *Resilient Bridgeport* project to seek information and provide input as well as working with their neighbors to achieve the shared goal of flood-risk management. Respondents also expressed a preference in community workshops and presentations hosted by the *RB* project over public meetings. The fact

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that a vast majority of them expressed an interest in engaging the *RB* project and their neighbors to work on flood-risk management planning together, this is an excellent example of the “payoff” that substantial investment of time, effort and resources in community engagement could benefit the constituency of a flood-risk management project.

Lastly, respondents were also asked to indicate whether they would like to receive information about community-based flood-risk management planning through receiving selected material electronically. Results below describe the percentage of respondents that reply with a “maybe” or “yes” answer.

- Receiving a printable flyer that shows you how to access all the resilient project planning resources in the community: 12.6% maybe; 84.4% yes
- Receiving an email alert to learn about when and where a community-based planning event will be taking place: 14.3% maybe; 83.1% yes

These findings are strongly indicative of a very high level of interest expressed by the respondents in staying informed about the *RB* project. While the percentage of those who would like to receive a flyer to access the project’s planning resources in the community represent 97.3% of those who have heard of the *RB* project, the proportion of those who would like to receive an email alert to keep up with community-based planning events reflect 95.8% of the same. These percentages showcase the public outreach results of a state-led project that has allocated dedicated resources – including a “store front” in the South End neighborhood to provide public access to project information and activity (e.g., maps, plans and neighborhood meetings) – to make a highly visible presence and to build the desired social capital in the community. As the construction phase of the *RB* project will begin at the end of the current planning phase, the *RB* project has demonstrated a successful pilot case of community engagement to meet an intended project goal.

### **SECTION 4: ENGAGEMENT AND COMMUNICATION STRATEGY RECOMMENDATION**

Public engagement allows an institution to learn about and interact with its constituency in an open and transparent manner, which in turn better enables the institution to achieve its mission to serve the internal and external stakeholders. The concept of public engagement refers to a two-way interaction process between an institution and its constituency to arrive at a shared vision and understanding of the institution’s functions in meeting its short-term and long-term goals.

Public engagement also enables an institution to communicate with its constituency to achieve the objectives of information dissemination, knowledge transfer and social capital cultivation. The concept of public communication enacted by an institution reflects a conglomeration of branding, promotion and persuasion strategies that are conducive to enhancing constituency understanding of (and support for) the shared vision of the institution’s short-term and long-term project objectives.

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An effective approach for conducting successful public engagement should focus on formulating a set of objectives and strategies to serve as the basis for both the institution and its constituency to attain a cohesive, collaborative and reciprocal working relationship. A set of community-based engagement and communication objectives and practices associated with building social resilience is proposed below. These objectives and practices will be utilized as the basis for discussing recommended tailored strategies for each of the project sites accordingly.

### 4.1 Recommended Engagement Objectives

*Values and Vision.* Make residents and stakeholders become aware of the institutional values and vision that serve as the guidepost for community-based resilience planning.

- *Accountability and Openness.* Enable residents and stakeholders to have a clear understanding and appreciation for why and how institutional resilience planning is conducted as well as what and how resilience projects will be implemented.
- *Mutuality and Trust.* Provide residents and stakeholders the opportunity to develop a relationship with the institution, based on the belief of mutuality and reciprocity to establish a mutual trust.
- *Partnership and Social Capital.* Allow residents and stakeholders to become partners of a community network whose social capital could become the foundation that contributes to institutional resilience planning.
- *Facilitate Dialectics and Communication.* Afford residents and stakeholders an open channel for discourse to achieve a shared vision and shared objectives for institutional resilience planning.

#### 4.2.1. Recommended Communication Objectives

An effective communication strategy that targets a specific community or population segment should focus on an audience-centered approach that will permit the institution to apply both a “pull” and “strategy” to maximize its communication objectives.

- *Audience Motivations.* Assess audience motivations for pursuing resilience-planning information, knowledge and skills as well as potential barriers and motivators as the basis for increasing their resilience efficacy and commitment.
- *Audience Beliefs.* Cultivate audience beliefs toward resilience planning that are consistent with scientific and rationale thinking, based on a relatable and accessible “common-sense” approach.
- *Audience Attitudes.* Shape audience attitudes toward resilience planning to elicit positive association between resilience knowledge, skills and planning at the individual and community level.
- *Audience Actions.* Mobilized audience behaviors that will lead them to accept and advocate social resilience and/or become part of the community network that participates in and contribute to community resilience planning.

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- *Audience Discourse.* Create a platform for audience discourse that aims at interacting with the audience to dialogue about resilience ideas and strategies that make resilience-planning information, knowledge and skills available, accessible and applicable.

### 4.2 The Town of Fairfield

The engagement objectives and practices for the Town of Fairfield could take into consideration those factors that may influence how its residents perceive public engagement objectives, as related to flood-risk management planning.

Based on the focus group and survey findings reported above, those key factors can include the need to enhance perceived confidence in the ability of the Town and its residents to address its resilience challenge as a community. At an individual level, factors such as perceived level of flood risk and/or experience with property damage could contribute to a resident's motivation to participate in community-based resilience planning. At an institutional level, at least half of the survey respondents indicated sufficient interest in engaging the FECB to learn more about flood- and erosion-risk mitigation plans.

Given the potential barriers and motivations discussed thus far, it would appear that the Town of Fairfield could consider developing a set of engagement activities that aim at building individual and community understanding as well as confidence in the capacity of the Town's residents to participate in and contribute to community resilience planning.

#### 4.2.1. Fairfield Engagement Strategy

The ensuing discussion provides an example of an *engagement strategy* that acts a *citizen-led Task Force, Citizens for A Resilient Fairfield (or CFARF)*. This *Task Force* could be consisted of the Town's citizen representatives who serve in relevant advisory committees (e.g., Earth Day Committee), coalitions (e.g., Fairfield Citizen Corp Council) and task forces (e.g., Sustainable Fairfield Task Force) as well as commissions (e.g., Conservation Commission and Town & Zoning Commission) and the Flood and Control Board (FECB).

Additional members for *CFARC* could include community organization representatives – including but are not limited to Chamber of Commerce, neighborhood associations, faith organizations, educational institutions and local NGO's – that are important stakeholders for the community *Task Force*.

Members of this *Task Force* could create different teams, based on the engagement tasks that most match their expertise and constituent characteristics. Each of these teams could help organize and mobilize their social networks to invite their constituents to participate in community resilience planning events.

In terms of engagement activity planning, below are some examples for consideration.

- First, consider surveying the Fairfield residents through the use of different communication channels, aided by the constituency networks of the board members, to plan a “calendar of events” that meets the resilience needs of the Town.

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- Second, match the topics and events accompanying resilience planning with constituent interests in a programmatic manner. This could mean that theme-oriented events that are tailored for different constituency groups, alongside events that target the entire community as a whole.
- Third, consider planning the type of events that would allow residents to participate through hands-on activities in competitive task teams; in this way, the residents could feel that they are both mentally challenged and physically involved in learning or practicing resilience planning. This could mean building in hands-on and interactivity components in selected engagement activities. For instance, immersive digital technologies--such as augmented reality or virtual reality programs--could be exciting tools for engaging the residents to become a resilience project designer.

Fourth, provide on-site experiential learning opportunities that would allow the residents to witness and understand the impact of human activity, sea-level rise, flood and erosion on their Town. For instance, it could be useful to plan and implement do-it-yourself resilience projects. These could range from encouraging every resident to plan at least one tree on Earth Day annually, to working with one's neighbors to improve drainage in the entire neighborhood. Involving K-12 pupils and college students in resilience project design contests (e.g., essays, posters, videos, architectural designs or social marketing campaigns) could be a good way to engage families and schools in the community.

- Fifth, partner with local businesses, philanthropic organizations and NGO's as well as colleges and universities to help sponsor scholarship, fellowship and/or internship opportunities for students or residents to study and create resilience design ideas.

### 4.2.2 Fairfield Communication Strategy

The communication functions of the *Task Force* could help facilitate a continuous and interactive discourse about resilience planning between the residents and the Town itself. A dedicated webpage could perhaps be created for sharing useful information (e.g., preparedness, mitigation and recovery tips and strategies) and resilience planning resources (e.g., linking to the FECB's webpage for accessing the Town's mitigation plan) and more. The webpage could be designed to include interactive communication functions that would allow residents to submit questions, suggestions or comments about resilience planning. It could also be developed to serve as a virtual "store front" to market the mission of resilience planning for the Town.

Other communication strategies that could complement an engagement event could include the examples below.

- First, establish an *identity* for the resilience planning enterprise that could communicate the virtue of citizen involvement and community collaboration to improve the socioeconomic growth and quality of life for the Town's residents. In this case, an analysis of the history of the Town and its contemporary identity could help craft this *identity*, which could be conveyed in a crisp statement or even a concise tagline.
- Second, collaborate with social marketing and/or science communication scholars or practitioners to develop resilience communication materials and tools that are tailored for the consumption of non-scientists to help facilitate scientific or technical information processing and knowledge transfer.

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- Third, when conducting a presentation or discussion about resilience planning, consider making the presentation content simple (e.g., using easy to understand language) and relatable (e.g., using examples relevant to the audience) for the audience. These presentations should also be visually interesting (e.g., using visual tools, animations or videos) as well as interactive (e.g., prompting a two-way discourse) and inclusive (e.g., facilitating a group dialogue).
- Fourth, utilize all communication venues to disseminate (or *push*) and engage (or *pull*) the residents. These communication venues can include interpersonal, group, organizational and mass communication channels, digital or otherwise.
- Fifth, consider constructing a communication network that can help cultivate individual and collective efficacy and social capital to help facilitate resilience planning objectives.

### 4.3 The City of Bridgeport

Bridgeport is the largest city in the state of Connecticut and has a diverse racial, ethnic and socioeconomic makeup. This project collected data in the South End area of the city, which is the resilience planning site for the *Resilient Bridgeport Project*. To consider the key factors that may help formulate effective public engagement strategies to promote flood-risk management planning, it would be useful to review the focus group and survey findings reported earlier.

As the survey findings reported earlier are skewed toward South End residents with a higher educational attainment, income level and home ownership ratio, the key factors observed will reflect primarily the views of these respondents with a higher SES background. These factors suggest that survey respondents have a moderate to moderately high level of confidence in the City and community residents' ability to take on the challenge of resilience planning together. Respondent perceptions of flood-risk exposure and/or experience with flood damage on personal property could influence their motivation to partake in community-based resilience planning. Furthermore, 66% to 90% of the survey respondents mentioned that they are interested in participating in different resilience planning activities hosted by the *Resilient Bridgeport Project*.

With the *Resilient Bridgeport Project* leading the way, a series of engagement events – including public meetings and design workshops – have already been advanced with visible success. Hence, the proposed engagement strategy below will focus on activities that could be considered for other future resilience planning projects in the City of Bridgeport or other similar urban environments in CT's coastal communities.

#### 4.3.1 Bridgeport Engagement Strategy

An example of an *engagement strategy* discussed here could be hypothetically labeled as ***Citizens for A Resilient Bridgeport (or CFARB)***. In social marketing terms, this hypothetical label could be considered an “extension brand” – which builds on the success of the “parent brand” – the *Resilient Bridgeport Project*.

*CFARB*, as a citizen-led *Task Force*, could imitate the composition of “Citizen Advisory Committee” of the *Resilient Bridgeport Project*. Citizen members who serve on this *Task Force* could be leaders that represent different constituencies in the City of Bridgeport, such as

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neighborhood associations (e.g., Seaside Village Association), cultural organizations (e.g., Mary & Eliza Freeman Center for History and Community), community organizations (e.g., South End Neighborhood Revitalization Zone and Bridgeport Economic Development Corporation), faith-based organizations, local businesses, schools/educational institutions (e.g., University of Bridgeport) and local NGO's (e.g., Groundwork), among others.

*CFARB* could consider working with two entities that have responsibilities in overseeing the City's resilience planning; they are (1) the *Common Council* (or the City Council), which functions as the Flood and Erosion Control Board; and (2) the *Citizens Advisory Committee*, which provides consultation for environmental policies.

Similar to what has been proposed for the Town of Fairfield, *CFARB* could develop different engagement task teams to allow the *Task Force* to best represent the interest of their constituents. Each task team could utilize their social capital to motivate and mobilize their social networks to become active in community resilience planning.

As for engagement activity planning, a set of examples is shared below.

- First, consider encouraging the *Task Force* members to contact their constituents on a personal basis--either during community gathering events (e.g., church service or school events), social functions (e.g., apartment/condo/neighborhood member gatherings or library socials) and/or social media platforms--to survey the types of resilience events that may be of interest to them. The information gathered by the *Task Force* could then be compiled to plan a "Calendar of Events" to promote resilience planning activities.
- Second, the key to conducting engagement events for urban residents with diverse racial, ethnic and socioeconomic characteristics may depend on making these residents become familiar with resilience planning that could help them survive a severe flood risk in the future. This approach will require matching the resilience topics/events, constituent needs and cultural considerations in a tailored manner. Special considerations could be formulated to provide access to affordances to empower the vulnerable population segments in the community to be resilience-aware and -efficacious.
- Third, it would be useful to consider planning events that would allow residents to obtain hands-on experience with resilience practices and skills that are useful to them in time of need. This could suggest designing these resilience planning events with activities that could involve the entire family as well as residents with different levels of social, economic or physical mobility. Demonstrations for how to use mobile phone technologies/applications that could be utilized to make emergency contacts, find evacuation routes, locate emergency shelters and the like could be valuable. Utilizing immersive digital technologies – such as augmented reality or virtual reality programs – could be another way for encouraging the residents to learn how to navigate the different aspects of resilience planning (e.g., preparedness, mitigation and recovery) as well.
- Fourth, provide experiential learning opportunities that could enable the residents to learn how environmentally unfriendly human activity, sea-level rise, flood and erosion could negatively impact the climate and their immediate physical environment. Planning home-based resilience projects could also be an excellent approach to help provide interested residents with resilience training in their own living space. These projects could include

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encouraging residents to install safety features in multi-unit dwelling units or improve drainage in their neighborhood. Engaging school children, college students and members of different neighborhoods to enter resilience design contests (featuring essays, artwork, architectural designs or social marketing campaigns) could be a fun way to cultivate resilience planning interest and knowledge.

- Fifth, partner with local businesses, large corporations, philanthropic organizations and NGO's – in addition to colleges and universities – to sponsor scholarship or fellowship opportunities for students or residents to study and create locally viable resilience design ideas and projects.

### 4.3.2 Bridgeport Communication Strategy

The communication functions of *CFARB* could help coordinate an open dialogue between the residents and those who have oversight duties over planning flood and control measures in the community. To provide a destination for sharing the initiatives and activities of *CFARB*'s grassroots activism, a dedicated webpage could be provided for facilitating public discourse and resource sharing (i.e., linking to the Common Council and Citizens Advisory Committee's webpage for accessing resilience planning policy and regulations) and more. The design of this webpage could consider providing interactive communication functions to offer residents a venue for submitting questions, suggestions, or comments about resilience planning. This dedicated virtual space could also serve as a virtual "store window" to display and market its advocacy for resilience planning in the City of Bridgeport.

Potential communication strategies that could help elevate the success of an engagement event could include the following examples.

- First, establish a "social identity" for the resilience planning advocacy that could communicate the value of civic participation and community engagement to protect the life and property of Bridgeport residents. In this case, an identity that reflects on the historic significance of the city in the state and embodies the diverse racial/ethnic cultures of contemporary Bridgeport could perhaps be etched in a verbal statement accompanied by a distinctive visual representation.
- Second, consult with social marketing or communication experts to develop resilience communication materials and tools that can be easily adopted by and are accessible to residents with varying socioeconomic and racial/ethnic backgrounds to help promote scientific or technical information and knowledge learning. For instance, special attention could be targeted to utilize the *communication style* (including materials, tools, activities and venues used) that may best connect with members of a particular neighborhood, faith organization, cultural association, civic league and the like.
- Third, it is essential to conduct presentations or discussions about resilience planning in a format that is easy to understand and relatable to the audience's life in a busy urban environment. It is equally important to make the presentation materials interesting, by utilizing visual communication tools as well as interactive communication devices (e.g., animation or digital simulation) to stimulate audience interest and learning. To help make resilience planning a *cool operation* with a tint of urban sophistication, recruiting local artists to create artwork and/or perform music or plays that express the *power of social*

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*resilience* against the hostile effects of climate change could also be an effective approach for cultivating community efficacy and empowerment.

- Fourth, apply social marketing communication techniques to disseminate (or *push*) resilience planning messages and elicit (or *pull*) resilience planning engagement from the audience. As smartphones remain unavailable to nearly 30% of low-income households –
- and about 45% of these households don't have broadband services and a computer at home,<sup>27</sup> – reaching the economically disadvantaged population could be a challenge. Hence, the communication strategy could emphasize one-on-one interpersonal, neighborhood and family/friend/relative venues that could reach the hard-to-reach residents. Likewise, utilizing digital communication platforms remains an important channel to connect with those residents who are online and digital mobile.
- Fifth, cultivate social capital by promoting social connections between neighbors who live in the same apartment/condo building and neighborhood. As social capital could serve as the basis for building both individual and collective efficacy, it could also provide the backbone for promoting community-based resilience planning.

### SECTION 5: SUMMARY AND CONCLUSIONS

The current project is a pilot study that explores the influence of different human factors on individuals' cognitive, affective and behavioral resilience toward flood and erosion risk in their community. This social science theory-based inquiry undertaken by the current study aims at filling an empirical gap – in both the scholarly and practice literatures – to gain a better understanding of the issues surrounding social resilience at the individual and community level. To meet the study objectives, the project targeted selected areas that are most impacted by flood and erosion risk, as identified by major stakeholders from each project site, namely, the Town of Fairfield and City of Bridgeport.

#### 5.1 Project Summary

The Town of Fairfield is a suburban community whose residents are relatively homogeneous in terms of their demographic characteristics, education background and household income level. By comparison, the City of Bridgeport is the largest city in Connecticut; its residents are highly diverse in their demographic attributes, education status and household income profile. For this reason, it was generally anticipated that study findings generated from each of these project sites would be more dissimilar than similar. Findings from this study both confirmed and disconfirmed this anticipation, depending on the issue at stake.

Specifically, residents in both communities share similar fear, anxiety, and vulnerability beliefs associated with the flood and erosion risk that they face at the individual and community level. These cognitive and affective responses don't necessarily translate to uniform beliefs about their confidence in (and motivation to reduce) their risk exposure by engaging in resilience planning

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<sup>27</sup> Anderson, M. & Kumar, M. (2019, May 7). Digital divide persists even as lower-income Americans make gains in tech adoption. Pew Research Center, Retrieved from <https://www.pewresearch.org/fact-tank/2019/05/07/digital-divide-persists-even-as-lower-income-americans-make-gains-in-tech-adoption/>.

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activity. Fairfield respondents appear to feel less efficacious individually and collectively as a community to address their environmental risk, relative to Bridgeport respondents.

The biggest perceived barriers to resilience planning reported by the Fairfield sample include “other priorities” and then “high cost.” For the Bridgeport sample, these barriers are “apathy” and “need for special skills.” Financial considerations appear to figure prominently for the Fairfield, but not for the Bridgeport sample. This discrepancy can be explained by Bridgeport respondents’ belief in shared burdens for risk management between their own community, other CT’s coastal communities/residents and U.S. taxpayers, which is a belief only expressed by about half of their Fairfield counterparts.

While just over half of both samples believe that another *Sandy*-like superstorm could arrive in the next hurricane season, their decision-making style for flood-damage recovery is decisively different. In the hypothetical risk-seeking vs. risk-avoidance scenarios provided in the context of a financial loss vs. gain in making flood-damage repair, Fairfield residents appear to be relatively more risk averse than their Bridgeport counterparts. It is likely that these results could have been moderated by other social and psychological factors that would require additional analysis and research to provide a scientifically sound explanation, if these insights are to be utilized for planning community-based public engagement and communication strategies.

In terms of disseminating flood-risk information, TV stations and cable TV networks that provide weather-forecast related news (online and offline) are the dominant sources, alongside weather-related mobile phone applications. While one’s social network (including family, relatives, friends and neighbors) is a similarly popular source for sharing flood-risk information for Bridgeport respondents, it is a much less cited source for their Fairfield counterparts. Even though social media are the least referenced sources for receiving flood-risk information, the Bridgeport sample are two-to-ten times more likely than the Fairfield sample to report that they receive such information from social media platforms. These findings about social media use may be indicative of the stronger social ties/capital among Bridgeport than Fairfield respondents in risk-information sharing via online social networks.

When a hypothetical parcel tax policy (independent from the property value of the parcel) is proposed to the respondents as an option to help fund local resilience projects, most respondents from both communities believe that the policy will receive support from their own household (or property owners) at risk in CT’s coastal community. They also believe that a bonding (rather than taxing) policy will be a more viable funding scheme. While most Bridgeport respondents support a flat fee for all property owners, regardless of ownership type, most Fairfield respondents favor a prorated fee (weighed by property proximity to a floodplain). Both sets of respondents prefer the lowest hypothetical annual tax rate presented to them (i.e., \$20 per parcel); between 18% and 25% of all respondents would support the highest tax rate (i.e., \$75 per parcel).

A majority of respondents from both communities consider the following information to be important to them: who is in charge of resilience project planning, what these projects are, how much the projects would cost, and whether these projects would affect the residents/community. The importance of science in validating the rationale for planning resilience projects is conferred by 79%-87% of the respondents. While these statistics supporting the value of science outpaces

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those reported by the general public, a recent poll found that public trust in environmental scientists is on the upswing. In particular, even though only 16% of the public reportedly has “a lot of familiarity” with what environmental scientists do and less than half (43%) believe these scientists “care about the community/the public,” a majority (57%) have a “mostly positive view” about them and have “heard/read about them” in the news (60%).<sup>28</sup>

As for how best to communicate with and engage them in resilience planning activities, respondents from the two communities have divergent views. The top-three most effective means for communication mentioned by the Fairfield sample include the use of emails, public meetings and then phone messages. Bridgeport respondents prefer the utilization of inter-neighborhood working groups and public meetings, followed by neighborhood/community design workshops and emails/phone messages. Aside from both choosing the formal public meetings as the second most favorite communication venue, the Fairfield sample appears to favor electronic channels and the Bridgeport sample seems to desire both in-person and electronic channels for communication.

Lastly, even as a small number of Fairfield respondents (12.7%) have ever heard of the Town’s citizen-led *Flood and Control Board*, between 26% and 44% of them are interested in directly engaging the *Board* to learn about or participate in resilience planning in their community. Combined with at least 46% of respondents who wish to keep up with the upcoming resilience planning events and another 25% who may be interested in receiving resilience planning resources, the Town of Fairfield could be poised to expand participation of resilience planning among its residents. As a vast majority of Bridgeport respondents have expressed interest in directly engaging and participating in resilience planning activities hosted by the *Resilient Bridgeport* project, an equal number of them also desire to keep up with resilience planning resources and upcoming planning events. The City of Bridgeport has thus gained a strong foundation for engaging its residents in future community-based resilience planning.

### 5.2 Limitations

When interpreting the current study findings, several limitations should be noted. First, a purposive sample instead of a random sample was recruited among individuals who reside in region that is most impacted by flood and erosion risk for both project sites. Second, the Fairfield sample includes residents who vary in their proximity to the flood/erosion threat along the Long Island Sound. The Bridgeport sample tends to include residents who share a similar level of exposure to coastal flood/erosion risk. Third, the study focuses on social resilience against coastal flood/erosion risk. It appeals to property owners who live near or in a floodplain more than those residents who are not property owners nor live near (or in) a floodplain. Fourth, both study samples likely contain self-selection bias, due to the fact that highly motivated individuals in the sampling frame might have chosen to participate in the study. Fifth, this self-selection bias has helped produce a sample that is not representative of the South End residents, in terms of their demographic characteristics (see Sec 3.1.1). This bias also reflects the on-going challenge of obtaining a higher response rate from the hard-to-reach individuals in society, as nearly one-

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<sup>28</sup> Funk, C., Hefferon, M., Kennedy, B., & Johnson, C. (2018, August 2). Trust and mistrust in Americans’ views of scientific experts. Retrieved from <https://www.pewresearch.org/science/2019/08/02/trust-and-mistrust-in-americans-views-of-scientific-experts/>.

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third of these individuals don't own a smartphone and more than half of them don't have an Internet-connected home computer (see Sec 5.1). Sixth, an in-person recruitment and/or survey will increase the response rate from those individuals who traditionally don't respond to other forms of surveys, especially an online survey that require the use of either a smartphone or Internet-connected computer at home. A large-scale, in-person recruitment and/or survey will require more time and resources for the study.

### 5.3 Conclusions

As the concept of community can vary depending on a combination of historical, social, cultural, racial, ethnic, geographic or ideological factors, it could be challenging to establish a community identity that aligns with individual beliefs about environmental conservation and climate change. This suggests that the success or failure in building resilient coastal communities is incumbent on finding a common ground and shared vision that could rally individuals with divergent beliefs to drive resilience planning and projects to benefit most, if not all members, of a community. Hence, an approach that looks to progressively build the social capital needed to achieve that common ground and shared vision could be cultivated – starting with households located on one street and then spread to multiple streets – followed one neighborhood and then multiple neighborhoods, and so on.

Public engagement and communication strategies are important tools for cultivating social capital among members of a community. If one approaches the concept of building community resilience from a social marketing communication perspective, then the relevant public engagement and communication strategies could be integrated into a larger social marketing communication strategy to help achieve the goal of building resilient coastal communities. Specifically, applying the marketing concepts of the 4 P's – Product, Price, Place and Promotion – a social marketing communication strategy could conceptualize “*resilient community*” as Product, “*costs and benefits*” as Price, “*practice venues*” as Place and “*engagement and communication strategy*” as Promotion. In addition, relevant resilience planning knowledge and skills should be integrated with each of the 4 P's in the social marketing communication strategy to connect the concept of community with resilience practice.

The lessons learned from the current project suggest that the notion of a *resilient community* should be conceptualized as a multidimensional living construct, if the goal is to build and strengthen the capacity, motivation and resolve of community members with different socio-cultural identities to resist the threat and reduce the risk stemming from climate change. Findings reported for this study have provided more questions than answers, in terms of how best to engage and communicate with members of a coastal community to promote resilience planning – as the foundation for building social resilience – and ultimately a resilient coastal community. Continuing research that could help validate or improve the results produced by this project is needed to further advance our scientific knowledge of how people process and respond to risk information as well as what could motivate them to develop the necessary efficacy at the individual and collective level to stare down the challenge presented by the forces of nature.

**BIBLIOGRAPHY**

- Akerlof, K., Maibach, E. W., Fitzgerald, D., Ceden, A. Y., & Neuman, A. (2013). Do people “personally experience” global warming, and if so how, and does it matter? *Global Environmental Change*, 23(1), 81-91.
- Antonetti, P. & Maklan, S. (2014). Exploring postconsumption guilt and pride in the context of sustainability. *Psychology and Marketing*, 31,717–735.
- Arendt, F., & Matthes, J. (2014). Nature documentaries, connectedness to nature, and pro-environmental behavior. *Environmental Communication*, 1-20.  
<https://doi.org/10.1080/17524032.2014.993415>
- Ajzen, I. (1985). From intentions to actions: A theory of planned behavior. In J. Kuhl & J. Beckman (Eds.), *Action-control: From cognition to behavior* (pp. 11-39). Heidelberg: Springer.
- Baan, P. J., & Klijn, F. (2004). Flood risk perception and implications for flood risk management in the Netherlands. *International Journal of River Basin Management*, 2 (2), 113-122.
- Babcicky, P., & Seebauer, S. (2018). Unpacking protection motivation theory: Evidence for a separate protective and non-protective route in private flood mitigation behavior. *Journal of Risk Research*, 1-18. <https://doi.org/10.1080/13669877.2018.1485175>
- Babcicky, P., & S. Seebauer (2017). The two faces of social capital in private flood mitigation: Opposing effects on risk perception, self-efficacy and coping capacity. *Journal of Risk Research*, 20 (8), 1017–1037.
- Bamberg, S., Masson, T., Brewitt, K., & Nemetschek, N. (2017). Threat, coping and flood prevention: A meta-analysis. *Journal of Environmental Psychology* 54, 116–126.
- Bamberg, S., & Moser, G. (2007). Twenty years after Hines, Hungerford, and Tomera: A new meta-analysis of psycho-social determinants of pro-environmental behaviour. *Journal of Environmental Psychology*, 27(1), 14e25.
- Bandura, A. (1977). Self-efficacy: toward a unifying theory of behavioral change. *Psychological Review*, 84(2), 191.
- Begg, C., Ueberham, M., Masson, T., & Kuhlicke, C. (2016). Interactions between citizen responsabilization, flood experience and household resilience: Insights from the 2013 flood in Germany. *International Journal of Water Resources Development*, 33, 591-608.
- Bickerstaff, K. (2004). Risk perception research: Socio-cultural perspectives on the public experience of air pollution. *Environment International*, 30(6), 827-840.

## BUILDING RESILIENT COASTAL COMMUNITIES

- Boamah, S., Armah, F., Kuuire, V., Ajibade, I., Luginaah, I., & McBea, G. (2015). Does previous experience of floods stimulate the adoption of coping Strategies? Evidence from cross sectional surveys in Nigeria and Tanzania. *Environments*, 2, 565-585.
- Bockarjova, M., & Steg, L. (2014). Can protection motivation theory predict pro-environmental behavior? Explaining the adoption of electric vehicles in the Netherlands. *Global Environmental Change*, 28, 276-288.
- Bonaiuto, M., Alves, S., De Dominicis, S., & Petrucci, I. (2016). Place attachment and natural hazard risk: Research review and agenda. *Journal of Environmental Psychology*, 48, 33-53.
- Bonaiuto, M., Alves, S., De Dominicis, S., & Petrucci, I. (2016). Place attachment and natural hazard risk: Research review and agenda. *Journal of Environmental Psychology*, 48, 33-53.
- Botzen, W. J. W., Aerts, J.C.J.H. & van den Bergh, J.C. (2009). Willingness of homeowners to mitigate climate risk through insurance. *Ecological Economics* 68 (8), 2265–2277.
- Bubeck, P., Kreibich, H., Penning-Rowsell, E., Botzen, W. J. W., De Moel, H., & Klijn, F. (2012). Explaining differences in flood management approaches in Europe and the USA-A comparative analysis. In F. Klijn, & T. Schweckendiek (Eds.), *Comprehensive flood risk management: Research for Policy and Practice*. Proceedings of the FLOODrisk2012 conference.
- Bubeck, P., Botzen, W. J. W., Laudan, J., Aerts, J. C. J. H., & Thieken, A. H. . (2017). Insights into flood-coping appraisals of protection motivation theory: Empirical evidence from Germany and France. *Risk Analysis*, doi: 10.1111/risa.12938
- Bubeck, P., Botzen, W. J. W., Kreibich, H., & Aerts, J. C. J. H. (2013). Detailed insights into the influence of flood-coping appraisals on mitigation behaviour. *Global Environmental Change*, 23 (5),1327–1338.
- Bubeck, P., Botzen, W. J. W., Kreibich, H., & Aerts, J. C. J. H. (2012). Long-term development and effectiveness of private flood mitigation measures: An analysis for the German part of the River Rhine. *Natural Hazards and Earth System Science*, 12 (11): 3507–3518.
- Bubeck, P., Botzen, W. J., & Aerts, J. C. (2012). A review of risk perceptions and other factors that influence flood mitigation behavior. *Risk Analysis*, 32(9), 1481-1495.
- Buchele B, Kreibich H, Kron A, Thieken A, Ihringer J, Oberle P, Merz B, & Nestmann F. (2006). Flood-risk mapping: Contributions towards an enhanced assessment of extreme events and associated risks. *Natural Hazards and Earth System Sciences*, 6(4). 485–503.
- Burningham, K., Fielding, J., & Thrush, D. (2008). ‘It'll never happen to me’: Understanding public awareness of local flood risk. *Disasters*, 32(2), 216-238.
- Clayton, S., Devine-Wright, P., Stern, P. C., Whitmarsh, L., Carrico, A., Steg, L., ... & Bonnef, M. (2015). Psychological research and global climate change. *Nature Climate Change*, 5 (7), 640-646.

## BUILDING RESILIENT COASTAL COMMUNITIES

- Carpenter, C. J. (2010). A meta-analysis of the effectiveness of health belief model variables in predicting behavior. *Health Communication, 25* (8), 661-669.
- Champion, V. L. (1999). Revised susceptibility, benefits, and barriers scale for mammography screening. *Research in Nursing & Health, 22*(4), 341-348.
- Cole, C., Quddus, M., Wheatley, A., Osmani, M., & Kay, K. (2014). The impact of local authorities' interventions on household waste collection: A case study approach using time series modeling. *Waste Management, 34*(2), 266-272.
- Cuite, C. L., Shwom, R., Hallman, W. K., Morss, R. E., & Demuth, J. L. (2017). Improving coastal storm evacuation messages. American Meteorological Society, Retrieved from DOI: 10.1175/WCAS-D-16-0076.1
- Dabbs Jr, J. M., & Leventhal, H. (1966). Effects of varying the recommendations in a fear-arousing communication. *Journal of Personality and Social Psychology, 4*(5), 525.
- Dahlstrom, M. F., & Scheufele, D. A. (2010). Diversity of television exposure and its association with the cultivation of concern for environmental risks. *Environmental Communication, 4*(1), 54-65.
- De Boer, J., Wouter Botzen, W. J., & Terpstra, T. (2014). Improving flood risk communication by focusing on prevention-focused motivation. *Risk Analysis, 34*(2), 309-322.
- Demeritt, D., Nobert, S., Cloke, H. L., & Pappenberger, F. (2013). The European flood alert system and the communication, perception, and use of ensemble predictions for operational flood risk management. *Hydrological Processes, 27*(1), 147-157.
- Demeritt, D., & Nobert, S. (2014). Models of best practice in flood risk communication and management. *Environmental Hazards, 13*(4), 313-328.
- Dittrich, R., Wreford, W., Butler, A., & Moran, D. (2016). The impact of flood action groups on the uptake of flood management measures. *Climatic Change 138*(3-4), 471-489.
- do Valle, P. O., Reis, E., Menezes, J., & Rebelo, E. (2004). Behavioral determinants of household recycling participation the Portuguese case. *Environment and Behavior, 36*(4), 505-540.
- Dono, J., Webb, J., & Richardson, B. (2010). The relationship between environmental activism, pro-environmental behaviour and social identity. *Journal of Environmental Psychology, 30*(2), 178-186.
- Dunlap, R. E., Van Liere, K. D., Mertig, A. G. and Jones, R. E. (2000), New trends in measuring environmental attitudes: Measuring endorsement of the new ecological paradigm: A revised NEP scale. *Journal of Social Issues, 56*, 425-442. doi: 10.1111/0022-4537.00176
- Etkin, D., & Ho, E. (2007). Climate change: Perceptions and discourses of risk. *Journal Of Risk Research, 10* (5), 623-641. doi:10.1080/13669870701281462

## BUILDING RESILIENT COASTAL COMMUNITIES

- Faulkner, H., McCarthy, S., & Tunstall, S. (2010). Flood risk communication. *Flood Risk Science and Management*, 386-406.
- Fischhoff, B. (1995). Risk perception and communication unplugged: Twenty years of process  
1. *Risk Analysis*, 15(2), 137-145.
- Flynn, J., Slovic, P., & Mertz, C. K. (1994). Gender, race, and perception of environmental health risks. *Risk Analysis*, 14(6), 1101-1108.
- Floyd, D. L., Prentice-Dunn, S., & Rogers, R. W. (2000). A meta-analysis of research on protection motivation theory. *Journal of Applied Social Psychology*, 30(2), 407-429.
- Frijda, N. (1986). *The Emotions. Studies in Emotion and Social Interaction*. New York: Cambridge University Press.
- Gregory, R., & Mendelsohn, R. (1993). Perceived risk, dread, and benefits. *Risk Analysis*, 13(3), 259-264.
- Grothmann, T., & Patt, A. (2005). Adaptive capacity and human cognition: the process of individual adaptation to climate change. *Global Environmental Change*, 15(3), 199-213.
- Grothmann, T., & Reusswig, F. (2006). People at risk of flooding: why some residents take precautionary action while others do not. *Natural Hazards*, 38(1-2), 101-120.
- Guerin, D., Crete, J., & Mercier, J. (2001). A multilevel analysis of the determinants of recycling behavior in the European Countries. *Social Science Research*, 30, 195-218.
- Haines, A., Kovats, R. S., Campbell-Lendrum, D., & Corvalán, C. (2006). Climate change and human health: Impacts, vulnerability and public health. *Public Health*, 120(7), 585-596.
- Hansmann, R., Bernasconi, P., Smieszek, T., Loukopoulos, P., & Scholz, R. W. (2006). Justifications and self-organization as determinants of recycling behavior: The case of used batteries. *Resources, Conservation and Recycling*, 47(2), 133-159.
- Hartmann, P., Apaolaza, V., D'Souza, C., Barrutia, J. M., & Echebarria, C. (2014). Environmental threat appeals in green advertising. *International Journal of Advertising*, 33(4), 741-765. doi:10.2501/IJA-33-4-741-765
- Hirsch, J. B. & Dolderman, D. (2007). Personality predictors of consumerism and environmentalism: A preliminary study. *Personality & Individual Differences*, 43, 1583-1593
- Hodgkins, S., & Orbell, S. (1998). Can protection motivation theory predict behaviour? A longitudinal test exploring the role of previous behaviour. *Psychology and Health*, 13(2), 237-250.
- Holbert, R. L., Kwak, N., & Shah, D. V. (2003). Environmental concern, patterns of television viewing, and pro-environmental behaviors: Integrating models of media consumption and effects. *Journal of Broadcasting & Electronic Media*, 47(2), 177-196.

## BUILDING RESILIENT COASTAL COMMUNITIES

- Izagirre-Olaizola, J., Fernández-Sainz, A., & Vicente-Molina, M. A. (2015). Internal determinants of recycling behaviour by university students: a cross-country comparative analysis. *International Journal of Consumer Studies*, 39(1), 25-34.
- Janz, N. K., & Becker, M. H. (1984). The health belief model: A decade later. *Health Education & Behavior*, 11(1), 1-47.
- Jensen, J. D., King, A. J., Carcioppolo, N., & Davis, L. (2012). Why are tailored messages more effective? A multiple mediation analysis of a breast cancer screening intervention. *Journal of Communication*, 62(5), 851-868.
- Johnson, C., Penning-Rowsell, E., & Tapsell, S. (2007). Aspiration and reality: Flood policy, economic damages and the appraisal process. *Area*, 3 (2), 214-223.
- Jongman, B., Hochrainer-Stigler, S., Feyen, L., Aerts, J. C. J. H., Mechler, R., Botzen, W. J. W., et al. (2014). Increasing stress on disaster-risk finance due to large floods. *Nature Climate Change*, 4, 264-268.
- Kellens, W., Terpstra, T., & De Maeyer, P. (2013). Perception and communication of flood risks: A systematic review of empirical research. *Risk Analysis* 33(1), 24–49.
- Kellens, W., Zaalberg, R., Neutens, T., Vanneuville, W., & De Maeyer, P. (2011). An analysis of the public perception of flood risk on the Belgian coast. *Risk Analysis: An International Journal*, 31 (7), 1055-1068.
- Keller, C., Siegrist, M., & Gutscher, H. (2006). The role of the affect and availability heuristics in risk communication. *Risk Analysis*, 26(3), 631-639.
- Kellstedt, P. M., Zahran, S., & Vedlitz, A. (2008). Personal efficacy, the information environment, and attitudes toward global warming and climate change in the United States. *Risk Analysis*, 28(1), 113-126.
- Keshavarz, M., & Karami, E. (2016). Farmers' pro-environmental behavior under drought: Application of protection motivation theory. *Journal of Arid Environments*, 127, 128-136.
- Kievik, M., and J. M. Gutteling. 2011. Yes, we can: Motivate Dutch citizens to engage in self-protective behavior with regard to flood risks. *Natural Hazards*, 59(3), 1475–1490.
- Knocke E.T & Kolivras, K.N. (2007). Flash flood awareness in southwest Virginia. *Risk Analysis*, 27 (1), 155–169.
- Koks, E. E., Jongman, B., Husby, T. G., & Botzen, W. J. (2015). Combining hazard, exposure and social vulnerability to provide lessons for flood risk management. *Environmental Science & Policy*, 47, 42-52.
- Koks, E. E., Jongman, B., Husby, T. G., & Botzen, W. J. (2015). Combining hazard, exposure and social vulnerability to provide lessons for flood risk management. *Environmental Science & Policy*, 47, 42-52.

## BUILDING RESILIENT COASTAL COMMUNITIES

- Kollmuss, A., & Agyeman, J. (2002). Mind the gap: Why do people act environmentally and what are the barriers to pro-environmental behavior? *Environmental Education Research*, 8(3), 239-260.
- Kortenkamp, K. V., & Moore, C. F. (2006). Time, uncertainty, and individual differences in decisions to cooperate in resource dilemmas. *Personality and Social Psychology Bulletin*, 32(5), 603-615.
- Kreibich H, Seifert I, Thielen AH, Lindquist E, Wagner K, Merz B. Recent changes in flood preparedness of private households and businesses in Germany. *Regional Environmental Change*, 1 (1):59–71.
- Kreibich, H., Bubeck, P., Van Vliet, M., & De Moel, H. (2015). A review of damage reducing measures to manage fluvial flood risks in a changing climate. *Mitigation and Adaptation Strategies for Global Change*, 20(6), 967-989
- Largo-Wight, E., Johnston, D. D., & Wight, J. (2013). The efficacy of a theory-based, participatory recycling intervention on a college campus. *Journal of Environmental Health*, 76(4), 26.
- Larson, M. A., & Massetti-Miller, K. L. (1985). Measuring change after a public education campaign. *Public Relations Review*, 10(4), 23-32.
- Larson, M. A., & Massetti-Miller, K. L. (1985). Measuring change after a public education campaign. *Public Relations Review*, 10(4), 23-32.
- Lazrus, H., Morss, R. E., Demuth, J. L., Lazo, J. K., & Bostrom, A. (2016). “Know what to do if you encounter a flash flood”: Mental models analysis for improving flash flood risk communication and public decision making. *Risk Analysis*, 36(2), 411-427.
- Lazarus, R.S. (1991). *Emotion and Adaptation*. New York, NY: Oxford University Press
- Schachter, S. (1964) The interaction of cognitive and physiological determinants of emotional state, *Advances in Experimental Social Psychology* (pp. 49–79). New York: Academic Press.
- Lazarus, R.S. (1966). *Psychological Stress and the Coping Process*. New York: McGraw-Hill.
- Leiserowitz, A. A. (2005). American risk perceptions: Is climate change dangerous? *Risk Analysis*, 25 (6), 1433-1442.
- Leiserowitz, A. (2006). Climate change risk perception and policy preferences: the role of affect, imagery, and values. *Climatic Change*, 77(1-2), 45-72.

## BUILDING RESILIENT COASTAL COMMUNITIES

- Leiserowitz, A., Maibach, E., Roser-Renouf, C., Feinberg, G., & Howe, P. (2013, April 13). *Climate change in the American mind: Americans' global warming beliefs and attitudes*. Yale University and George Mason University. New Haven, CT: Yale Project on Climate Change Communication. Retrieved from <http://environment.yale.edu/climate-communication-OFF/files/Climate-Change-American-Mind-October-2014.pdf>
- Leventhal, H. (1970). Findings and theory in the study of fear communications. In L. Berkowitz (ed.) *Advances in Experimental Social Psychology*, 5. New York: Academic Press, 119-86.
- Leventhal, H., Jones, S., & Trembly, G. (1966). Sex differences in attitude and behavior change under conditions of fear and specific instructions. *Journal of Experimental Social Psychology*, 2(4), 387-399.
- Lindell M.K., Hwang S.N. (2008). Household's perceived personal risk and responses in a multi-hazard environment. *Risk Analysis*, 28 (2):539–556
- Lindell MK, Perry R.W. (2000). Household adjustment to earthquake hazard: A review of the research. *Environmental Behaviour*, 32(4):461–501.
- Limon, M. S., & Kazoleas, D. C. (2004). A comparison of exemplar and statistical evidence in reducing counter-arguments and responses to a message. *Communication Research Reports*, 21(3), 291-298.
- Liviatan I, Trope Y, Liberman N (2008) Interpersonal similarity as a social distance dimension: Implications for perception of other's actions. *Journal of Experimental Social Psychology* 44, 1256 – 1269.
- Loewenstein G.F., Weber, E.U., Hsee, C.K., Welch, N. (2001). Risk as feelings. *Psychological Bulletin*, 127(2), 267–286.
- Lowe, T., Brown, K., Dessai, S., de França Doria, M., Haynes, K., & Vincent, K. (2006). Does tomorrow ever come? Disaster narrative and public perceptions of climate change. *Public understanding of science*, 15(4), 435-457.
- Lundgren, R. E., & McMakin, A. H. (2018). *Risk communication: A handbook for communicating environmental, safety, and health risks*. John Wiley & Sons.
- McCarty, J., & Shrum, L. (2001). The influence of individualism, collectivism, and locus of control on environmental beliefs and behavior. *Journal of Public Policy & Marketing*, 20(1), 93-104
- Maddux, J. E., & Rogers, R. W. (1983). Protection motivation and self-efficacy: A revised theory of fear appeals and attitude change. *Journal of experimental social psychology*, 19(5), 469-479.
- Martens, T., Garrelts, H., Grunenberg, H., & Lange, H. (2009). Taking the heterogeneity of citizens into account: Flood risk communication in coastal cities: A case study of Bremen. *Natural Hazards and Earth System Sciences*, 9(6), 1931-1940.

## BUILDING RESILIENT COASTAL COMMUNITIES

- Martin, I. M., Bender, H., & Raish, C. (2007). What motivates individuals to protect themselves from risks: the case of wildland fires. *Risk Analysis*, 27(4), 887-900.
- Mead, E., Roser-Renouf, C., Rimal, R. N., Flora, J. A., Maibach, E. W., & Leiserowitz, A. (2012). Information seeking about global climate change among adolescents: The role of risk perceptions, efficacy beliefs, and parental influences. *Atlantic Journal of Communication*, 20(1), 31-52.
- Melillo, J. M., Richmond, T.C., & Yohe, G.W. (2014). Climate change impacts in the United States: The third national climate assessment. *U.S. Global Change Research Program*, 841 doi:10.7930/JOZ31WJ2.
- Milne, S., Sheeran, P., & Orbell, S. (2000). Prediction and intervention in health-related behavior: A meta-analytic review of protection motivation theory. *Journal of Applied Social Psychology*, 30(1), 106-143.
- Morgan, M. G., Fischhoff, B., Bostrom, A., & Atman, C. J. (2002). *Risk communication: A mental models approach*. Cambridge University Press.
- Moser, S. C., & Ekstrom, J. A. (2010). A framework to diagnose barriers to climate change adaptation. *Proceedings of the National Academy of Sciences*, 107(51), 22026-22031.
- Morss, R. E., Wilhelmi, O. V., Downton, M. W., & Grunfest, E. (2005). Flood risk, uncertainty, and scientific information for decision making: lessons from an interdisciplinary project. *Bulletin of the American Meteorological Society*, 86(11), 1593-1602.
- Morss, R. E., Cuite, C. L., Demuth, J. L., Hallman, W. K., Shwom, R. (2018). Is storm surge scary? The influence of hazard, impact, and fear-based messages and individual differences on responses to hurricane risks in the USA. *International Journal of Disaster Risk Reduction*, 30, 44-58.
- Myers, T. A., Maibach, E. W., Roser-Renouf, C., Akerlof, K., & Leiserowitz, A. A. (2013). The relationship between personal experience and belief in the reality of global warming. *Nature Climate Change*, 3(4), 343-347.
- Nan X (2007) Social distance, framing, and judgment: A construal level perspective. *Human Communication Research*, 33, 489-514.
- Nisbet, E. K., & Glick, M. L. (2008). Can health psychology help the planet? Applying theory and models of health behaviour to environmental actions. *Canadian Psychology/Psychologie canadienne*, 49(4), 296.
- Nisbet, M. C. (2009). Communicating climate change: Why frames matter for public engagement. *Environment: Science and Policy for Sustainable Development*, 51(2), 12-23.
- Nisbet, M. C., Scheufele, D. A., Shanahan, J., Moy, P., Brossard, D., & Lewenstein, B. V. (2002). Knowledge, reservation, or promise? A media effects model for public perceptions of science and technology. *Communication Research*, 29, 584-608.

## BUILDING RESILIENT COASTAL COMMUNITIES

- Olfert, A., & Schanze, J. (2008). New approaches to ex-post evaluation of risk reduction measures: The example of flood proofing in Dresden, Germany. In P. Samuels, S. Huntington, W. Allsop, & J. Harrop (Eds.), *Flood Risk Management: Research and Practice* (pp. 1173-1184). London: Taylor & Francis Group.
- Olli, E., Grendstad, G., & Wollebaek, D. (2001). Correlates of environmental behaviors bringing back social context. *Environment and Behavior*, 33(2), 181-208.
- Paton, D., L. Smith, & Johnston, D.M. (2000). Volcanic hazards: Risk perception and preparedness. *New Zealand Journal of Psychology*, 29 (2), 86–91.
- Patz, J. A., Campbell-Lendrum, D., Holloway, T., & Foley, J. A. (2005). Impact of regional climate change on human health. *Nature*, 438(7066), 310-317.
- Peacock W.G. (2003). Hurricane mitigation status and factors influencing mitigation status among Florida's single-family homeowners. *Natural Hazards Review*, 2003, 4(3):149–158.
- Pearson, H. C., Dawson, L. N., & Breitkopf, C. R. (2012). Recycling attitudes and behavior among a clinic-based sample of low-income Hispanic women in southeast Texas. *PloS one*, 7(4), e34469. Retrieved from <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0034469>. (October 14, 2016).
- Pidgeon, N., & Fischhoff, B. (2011). The role of social and decision sciences in communicating uncertain climate risks. *Nature Climate Change*, 1(1), 35-41.
- Plapp, T., & Werner, U. (2006). Understanding risk perception from natural hazards: Examples from Germany. *Risk Analysis*, 21, 101-108
- Plattner T., Plapp T., Hebel B. (2006). Integrating public risk perception into formal natural hazard risk assessment. *Natural Hazards and Earth System Sciences*, 6(3):471–483.
- Ploran, E. J., Trasciatti, M. A., & Farmer, C. (2018). Efficacy and authority of the message sender during emergency evacuations: A mixed methods study. *Journal of Applied Communication*, 46(3), 291-322.
- Poussin, J. K., Botzen, W.J.W., & Aerts, J.C.J.H. (2014). Factors of Influence on flood damage mitigation behaviour by households. *Environmental Science & Policy* 40, 69–77.
- Poussin, J. K., Botzen, W. J. W., & Aerts, J.C.J.H. (2015). Effectiveness of flood damage mitigation measures: Empirical evidence from French flood disasters. *Global Environmental Change*, 31, 74–84.
- Richert, C., Erdlenbruch, K. & Figuières, C. (2017). The determinants of households' flood mitigation decisions in France: On the possibility of feedback effects from past investments. *Ecological Economics*, 131, 342–352.

## BUILDING RESILIENT COASTAL COMMUNITIES

- Rickard, L. N., Yang, Z. J., Schuldt, J. P., Eosco, G. M., Scherer, C. W., & Daziano, R. A. (2017). Sizing up a superstorm: Exploring the role of recalled experience and attribution of responsibility of judgements of future hurricane risk. *Risk Analysis*, 37(12), 2334-2349.
- Rogers, R. W. (1975). A protection motivation theory of fear appeals and attitude change. *The Journal of Psychology*, 91(1), 93-114.
- Roseman, Ira J. (1996). Appraisal determinants of emotions: Constructing a more accurate and comprehensive theory. *Cognition & Emotion*, 10(3), 241 -278.
- Rosenstock, I. M. (1974). Historical origins of the health belief model. *Health Education Monographs*, 2,328–335. doi:10.1177/109019817400200403
- Marlon, J., Rosenthal, S., Feinberg, G., Pal, S. and Leiserowitz, A. (2015). Hurricane Perceptions of Coastal Connecticut Residents: October, 2014. Yale University. New Haven, CT: Yale Project on Climate Change Communication.
- Marlon, J.R., Rosenthal, S., Feinberg, G., Pal, S., & Leiserowitz, A. (2015). Hurricane Attitudes of Coastal Connecticut Residents: A Segmentation Analysis. June 29, 2015. Yale University. New Haven, CT: Yale Project on Climate Change Communication.
- Roser-Renouf, C., & Nisbet, M. C. (2008). The measurement of key behavioral science constructs in climate change research. *International Journal of Sustainability Communication*, 3, 37-95.
- Rözer, V., Müller, M., Bubeck, P., Kienzler, S., Thielen, A., Pech, I., Schröter, K., Buchholz, O., & Kreibich, H. (2016). Coping with pluvial floods by private households. *Water*, 8(7), 1–24.
- Savage, I. (1993). Demographic influences on risk perceptions. *Risk analysis*, 13(4), 413-420.
- Searles, K. (2010). Feeling good and doing good for the environment: The use of emotional appeals in pro-environmental public service announcements. *Applied Environmental Education and Communication*, 9(3), 173-184.
- Semenza, J. C., Ploubidis, G. B., & George, L. A. (2011). Climate change and climate variability: personal motivation for adaptation and mitigation. *Environmental Health*, 10(1), 46.
- Shanahan, J., & McComas, K. (1999). *Nature stories, depictions of the environment and their effects*. Cresskill, NJ: Hampton Press
- Shanahan, J., Morgan, M., & Stenbjørne, M. (1997). Green or brown? Television and the cultivation of environmental concern. *Journal of Broadcasting & Electronic Media*, 41(3), 305-323.
- Siegrist M & Gutscher H. (2006). Flooding risks: A comparison of lay people's perceptions and expert's assessments in Switzerland. *Risk Analysis*, 26(4), 971–979

## BUILDING RESILIENT COASTAL COMMUNITIES

- Siegrist M & Gutscher H. (2008). Natural hazards and motivation for mitigation behavior: People cannot predict the affect evoked by a severe flood. *Risk Analysis*, 28(3), 771–778.
- Sjoberg L. (2001). Emotions and risk perception. *Risk Management*, 9, 223–237.
- Slovic, P. (1987). Perception of risk. *Science*, 236(4799), 280-285.
- Slovic, P., Finucane, M. L., Peters, E., & MacGregor, D. G. (2004). Risk as analysis and risk as feelings: Some thoughts about affect, reason, risk, and rationality. *Risk Analysis*, 24(2), 311-322.
- Slovic, P., & Peters, E. (2006). Risk perception and affect. *Current Directions in Psychological Science*, 15, 322-325.
- Slovic, P., Layman, M., & Flynn, J. H. (1991). Perceived risk, trust, and the politics of nuclear waste. *Science*, 254, 5038, 1603-1608.
- Slovic, P., Fischhoff, B., & Lichtenstein, S. (1985). Characterizing perceived risk. In R. W. Kates, C. Hohenemser and J. Kasperson (eds.), *Perilous progress: Managing the hazards of technology*. (pp. 91-125). Boulder, CO Westview.
- Slovic, P., Fischhoff, B., Lichtenstein, S., & Roe, F. J. C. (1981). Perceived risk: psychological factors and social implications [and discussion]. *Proceedings of the Royal Society of London. A. Mathematical and Physical Sciences*, 376(1764), 17-34.
- Smith, C. A., & Ellsworth, P. C. (1985). Patterns of cognitive appraisal in emotion. *Journal of Personality and Social Psychology*, 48(4), 813.
- Spence, A., & Pidgeon, N. (2010). Framing and communicating climate change: The effects of distance and outcome frame manipulations. *Global Environmental Change*, 20(4), 656-667.
- Spence, A., Poortinga, W., & Pidgeon, N. (2012). The psychological distance of climate change. *Risk Analysis*, 32(6), 957-972.
- Stainback, R.D. & Rogers, R.W. (1983). Identifying effective components of alcohol abuse prevention programs: effects of fear appeals, message style and source expertise, *International Journal of Addictions*, 18, 393-405
- Stern, P. C., Dietz, T., Abel, T. D., Guagnano, G. A., & Kalof, L. (1999). A value-belief-norm theory of support for social movements: The case of environmentalism. *Human Ecology Review*, 6(2), 81-97.
- Takao K, Motoyoshi T, Sato T, Fukuzono T. (2004). Factors determining residents' preparedness for floods in modern megalopolises: The case of the Tokai flood disaster in Japan. *Journal of Risk Research*, 7(7–8):775–787.
- Takao K, Motoyoshi T, Sato T, & Fukuzono T. (2004). Factors determining residents' preparedness for floods in modern megalopolises: The case of the Tokai flood disaster in Japan. *Journal of Risk Research*, 7 (7–8), 775–787.

## BUILDING RESILIENT COASTAL COMMUNITIES

- Tapsell, S. M., Penning-Rowsell, E. C., Tunstall, S. M., & Wilson, T. L. (2002). Vulnerability to flooding: Health and social dimensions. *Philosophical Transactions of the Royal Society London*, 360, 1511e1525.
- Terpstra, T. (2011). Emotions, trust, and perceived risk: Affective and cognitive routes to flood preparedness behavior. *Risk Analysis*, 31(10), 1658–1675.
- Terpstra, T., Lindell, M. K., & Gutteling, J. M. (2009). Does communicating (flood) risk affect (flood) risk perceptions? Results of a quasi-experimental study. *Risk Analysis: An International Journal*, 29(8), 1141-1155.
- Truelove, H. B., Carrico, A.R., & Thabrew, L. (2015). A socio-psychological model for analyzing climate change adaptation: A case study of Sri Lankan paddy farmers. *Global Environmental Change*, 31, 85–97.
- van der Linden Sander (2014). On the relationship between personal experience, affect and risk perception: The case of climate change, *European Journal of Social Psychology*, 44, 430–440, doi: 10.1002/ejsp.2008
- Vicente, P., & Reis, E. (2008). Factors influencing households' participation in recycling. *Waste Management & Research*, 26 (2), 140-146.
- Walker-Springett, K., Butler, C., & Adger, W. N. (2017). Wellbeing in the aftermath of floods. *Health & Place*, 43, 66e74.
- Weber, E. U. (2006). Experience-based and description-based perceptions of long-term risk: Why global warming does not scare us (yet). *Climatic Change*, 77 (1-2), 103-120.
- Weber, E. U. (2010), What shapes perceptions of climate change?. *WIREs Climate Change*, 1, 332–342. doi: 10.1002/wcc.41
- Weinstein, N. D. (1993). Testing four competing theories of health-protective behavior. *Health psychology*, 12 (4), 324.
- Weinstein N.D, Lyon, J.E, Rothman, A.J., & Cuite, C, L. (2000). Preoccupation and affect as predictors of protective action following natural disaster. *British Journal of Health Psychology*, 5:351–363.
- Whitney DJ, Lindell MK, Nguyen HD. Earthquake beliefs and adoption of seismic hazard adjustments. *Risk Analysis*, 2004; 24(1), 87–102.
- Wildavsky, A., & Dake, K. (1990). Theories of risk perception: Who fears what and why? *Daedalus*, 41-60.
- Kim Witte (1995) Generating Effective Risk Messages: How Scary Should Your Risk Communication Be?, *Annals of the International Communication Association*, 18(1), 229-254, DOI:[10.1080/23808985.1995.11678914](https://doi.org/10.1080/23808985.1995.11678914)

## BUILDING RESILIENT COASTAL COMMUNITIES

Yang, Z. J., Aloe, A. M., & Feeley, T. H. (2014). Risk information seeking and processing model: A meta-analysis. *Journal of Communication, 64*(1), 20-41.

Zaalberg, R., Midden, C., Meijnders, A., & McCalley, T. (2009). Prevention, adaptation, and threat denial: Flooding experiences in the Netherlands. *Risk Analysis, 29*(12), 1759–1778.

Zaleskiewicz, T., Piskorz, Z., & Borkowska, A. (2002). Fear or money? Decisions on insuring oneself against flooding. *Risk, Decision and Policy, 7*, 221–233.