Enhanced Engagement and Risk Communication for Residents in Underserved Communities:

Research Findings, Best Practices, and Lessons Learned 2022

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i. About this report

Residents in communities that are underserved and/or underrepresented in conversations about coastal hazards are often the most vulnerable to those hazards. This literature review of risk communication and community engagement was created to better understand how NOAA can effectively serve these communities and develop culturally relevant and targeted resources. They include those who are low income, recent immigrants, non-white ethnic groups, and people who live in rural communities. Topics explored here include effective risk communication approaches, barriers to risk communication, and individual or community risk tolerance. In this updated report, we describe the collective lessons learned from applying the best practices recommended in the literature review, including unexpected challenges from COVID-19. This work was conducted by North Carolina, Hawaii, and Mississippi-Alabama Sea Grant programs, which engaged stakeholders in place-based processes to build trust and community relationships.

ii. Acknowledgments

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Executive Summary

Flood risk along U.S. coastlines is increasing due to relative sea level rise. Increasing mean sea levels, storm surges, and chronic coastal flooding threaten regions by inundating low-lying areas, eroding populated coastal lands, increasing salinity of freshwater resources, affecting ecosystems, and converting dry lands into wetlands. The impacts of short-term increasing water levels, combined with long-term sea level rise, will not only cause flooding, erosion, and intrusion of saltwater into freshwater bodies, but will also come with serious financial consequences—damaging livelihoods and coastal resources. This future flood risk is predicted to disproportionately affect underserved communities[1].

NOAA and others recognize the need to integrate equity into all activities to address this challenge. By giving the public access to water information tailored specifically to a community's needs, NOAA strives to provide services so that a community may take appropriate actions to address coastal and water-related risks. NOAA and three Sea Grant programs (Mississippi-Alabama, Hawaii, and North Carolina) partnered to better understand how to communicate risk with underserved communities to prepare for sea level rise flooding.

This project was two-fold. The first part was a literature review conducted by NOAA intern Karla Lopez on best practice recommendations for effective long-term engagement with communities that are most vulnerable to sea level rise. The best practice recommendations are summarized in the first graphic. The second part of the project applied the best practices discussed in the literature review directly to community engagement activities conducted by resilience experts with Mississippi-Alabama Sea Grant, Hawaii Sea Grant, and North Carolina Sea Grant. The three Sea Grant programs engaged stakeholders in place-based processes to build trust and community relationships. Ultimately, the goal was to understand how to more fully and equitably engage communities in discussions around the long-term effects of climate change and coastal flooding in order to better meet community needs with tailored risk communication practices and funding. This second phase of the project revealed eight primary lessons, as shown in the second graphic.

Although many chronic flooding preparedness and adaptation guides exist, few address equity issues and appeal for inclusive engagement. The full report provides a detailed understanding of the processes involved in risk perception, risk behavior, and risk communication. It also provides a discussion of recent practices that could be effective in promoting a better understanding of sea level rise impacts and adaptation measures among underserved communities, with possible application for other climate and environmental hazards. The recommendations made in this report are intended for the broad spectrum of NOAA practitioners, funders, and staff to take a first step toward establishing a conversation and relationship with communities at a high risk from chronic sea level rise.

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1. *"'Underserved communities' refers to people sharing a particular characteristic, as well as geographic communities, that have been systematically denied a full opportunity to participate in aspects of economic, social, and civic life." Source: E.O. 13985 of Jan 20, 2021. Retrieved from federalregister. gov/d/2021-01753.*

PART I: Literature Review On Improving Risk Communication

I. Introduction

Vulnerability is defined as "the characteristics of a person or their group and their situation that influence their capacity to anticipate, cope with, resist, and recover from the impact of a natural hazard" (Wisner et al., 2004). The National Oceanic and Atmospheric Administration (NOAA) notes that, "In the U.S, about 40 percent of the population lives in relatively high population density coastal areas where relative sea level plays a role in flooding, shoreline erosion, and hazards from storms" ((NOAA, 2019b). About one-third of these residents are elderly, low-income, disabled, or otherwise socially vulnerable (NOAA, 2016). Global sea levels are rising and projected to continue rising at an accelerated rate in the coming decades, affecting all coastal residents, but this does not mean that all people are equally vulnerable to their effects (NOAA, 2019b; IPCC, 2014). Agencies like the Intergovernmental Panel on Climate Change (IPCC) have found that exposure, vulnerability, and resilience to climate impacts are tightly correlated to a population's socioeconomic status (IPCC, 2014). Although there is extensive research about risk perception and communication of acute flooding events (Campbell et al., 2020; Moser and Ekstom, 2010; Moser, 2009; Morrow, 2009), communication with underserved populations has been less studied and discussed, particularly as it relates to the topic of chronic sea level rise (Khan et al., 2020; Jurjonas et al., 2020; Bhattachan et al., 2018; Akerlof, 2017; IPCC, 2014; Clark et al., 2007).

Figure 1. Photo Credit Karl Dudman. Down East Community, Carteret County, North Carolina

Frontline communities[2] are those located near an existing environmental hazard, and typically are the ones that experience the first and the worst consequences of climate change (Egland and Kelley, 2020; Holland, 2017). It is important to note that not all frontline communities are necessarily underserved. Educational opportunity, financial resources, unemployment, out-migration, age, and race can increase a community's ability to respond to more frequent and intense flooding (Cleetus et al., 2015; Miller-Hesed and Paolisso, 2015). As cited by Trayler-Smith (2017): "Marginalized populations are those who have the smallest carbon footprint, but due to their socioeconomic status, geographic location, gender, and age, they are the ones who experience the worst effects of climate change."

Historically, underserved populations often live in low-lying, rural, and isolated areas with lower economic value, which made them more affordable places to live (Perry et al., 2018; Gross, 2017). Additionally, frontline communities are typically at a higher exposure to climate change-related events due to power imbalances that leave them without a voice within the political context (NAACP, 2019; Jurjonas and Seekamp, 2018; USDN, 2017). Years of systemic racism and social injustices have left government agencies[3] at all levels struggling to build relationships and effectively communicate risk to these communities (NAACP, 2019; USDN, 2017). While wealthier communities have more resources to explore novel measures to counter rising sea levels, residents in underserved frontline communities have fewer resources to expend on experimenting with potential solutions to defend against the impacts of climate change.

Chronic flooding events can cumulatively cause more damage than a single acute weather event, highlighting the need to communicate and educate frontline communities to plan for the effects of rising sea levels. Flooding associated with sea level rise has and will continue to impact frontline communities living in flood-prone areas, endangering lives, damaging homes, limiting people's access to reliable transportation, and inhibiting them from providing financial resources to their families (Khan et al., 2020; Cleetus et al., 2015). However, vulnerability to actual or expected climate change effects can be decreased through adaptation (GCC, 2020; Khan et al., 2020; Agyeman et al., 2007). The Fifth Assessment Report from IPCC defines adaptation as "the process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities. In some natural systems, human intervention may facilitate adjustment to expected climate and its effects" (IPCC, 2014).

Communication plays a key role in risk decision-making and response. Therefore, effective risk communication is an essential component of adaptive planning (Feldman et al., 2016; Morrow, 2009; Moser, 2009; McComas, 2006). When done effectively, risk communication conveys trust, awareness, and understanding. On the other hand, poor or deficient risk communication contributes to misinterpretations, misunderstandings, and distrust of both the communicator and the message

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2. Frontline communities are defined as communities that experience "first and worst" the consequences of climate change (Holland, 2017). Although not all frontline communities are necessarily underserved; the frontline communities highlighted in this paper were selected due to their high percentage of underserved populations.

3. Refers to all levels (Federal, state, and local) government agencies including NOAA

(Jurjonas et al., 2020; Cutter et al., 2012; Rowel et al., 2012). The ultimate goal of a risk communication plan is to help people make informed decisions about the risks they may face.

Recommendations made in this paper aim to address the gap between equity and climate adaptation by providing the causes of these problems, in addition to providing a better understanding of the reasoning behind risk perception and risk behavior. Further, these practices will be put into practice among frontline communities to communicate chronic risk from rising seas. Lessons learned will be shared back via the section, *Lessons Learned from Implementing Risk Communication Best Practices*.

i. Environmental Justice

Frontline communities in the U.S have a history of being forced from their homelands. Robert Bullard, the "father of environmental justice," defines the term "environmental justice" as, "The principle that all people are entitled to equal environmental protection regardless of race, color, or national origin. It's the right to live and work and play in a clean environment" (Milman, 2018).

With research mainly focused on Blacks[4], Hispanics, Asians, Pacific Islanders, and Native Americans, the environmental justice movement tries to address a statistical fact: people who live, work, and play in the most polluted environments of the country are usually people of color, ethnic minorities, and low-income residents (Skelton and Miller, 2016).

Environmental racism[5] is tied to racial segregation (Milman, 2018; Hardy et al., 2017; USDN, 2017; Agyeman et al., 2007). Historical systemic racism often forced people of color, ethnic minorities, immigrants, and low-income families to reside in low-lying areas prone to flooding, originally zoned for mixed residential or industrial use, and, in general, the least desirable land (Perry et al., 2018; USDN, 2017; Skelton and Miller, 2016; Gross, 2017; Agyeman et al., 2007). In the 1930s, federal housing policies actively and intentionally contributed to segregation, subsidizing development for middle- to low-income white households and prohibiting people of color from purchasing those homes (i.e., redlining) (Perry et al., 2018; Gross, 2017). Frontline communities are exposed to a disproportionate number of harmful conditions, including lack of greenspace, weak and/or failing infrastructure, fewer economic opportunities, higher human health problems, higher overall mortality, poor access to health care, inadequate education, fewer opportunities for safe recreation, poor quality housing, inequitable access to transit services, and community isolation or displacement (GCC, 2020; NCDEQ, 2020; Gross, 2017; Skelton and Miller, 2016; Douglas et al., 2012). The forced placement of locally unwanted land uses (i.e., toxic waste dumps, incinerators, factories, fossil fuel storages) in these communities resulted in the devastating loss of native natural and cultural resources (Dwyer, 2020; Kehaulani Watson-Sproat, 2020; Hardy et al., 2017).

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4. Recognizing that not all persons trace their lineage to the African continent, for this paper the word "Black" with a capital B is used. Black persons are described in this paper as a group of individuals having dark pigmented skin. The term is used when referring to groups in racial, ethnic, or cultural terms. Ultimately, it is highly recommended to ask the communities what is their preferred term to refer to them.

5. The disproportionate and intentional impact of environmental hazards on low-income and minority populations. Can be manifested through policies, rules, and regulations that benefit some populations (often white communities) while abandoning others (Milman, 2018; Hardy et al., 2017). Placement of communities in locally unwanted land uses (i.e., toxic waste dumps, incinerators, factories, fossil fuels storages), the lack of green spaces, and the exclusion of underserved populations from the leadership of the environmental decision-making process are only a few examples of environmental racism.

Environmental injustices also occur when governmental institutions favor strong industries and wealthy homeowners in disaster recovery and coastal hazards, with socioeconomic status and race playing a significant role in decision-making (Jurjonas et al., 2020; Boustan et al., 2020). A salient example of this was Hurricane Katrina in 2005. Katrina was one of the costliest and deadliest natural disasters in the U.S, claiming a disproportionately large number of Black lives and leaving many homes devastated along the Gulf Coast (USDN, 2017). Recovery efforts for the disaster were slow and benefited the wealthy, while often excluding people in underserved areas (USDN, 2017; Drimonis, 2016).

Payne-Sturges from the University of Maryland says environmental justice is an acknowledgment that people of color have been systematically excluded from decision-making and therefore unequally protected against environmental hazards (Caulfield, 2020). Chronic flood episodes derived from climate change, such as nuisance flooding, king tides, and flash flooding, can introduce severe bacterial contamination and toxic waste into communities, causing a public health hazard (Roesler, 2011). Aging municipal stormwater systems, bridges, highways, and other infrastructure systems built years ago are failing, placing communities that depend on them at a further disadvantage (NOAA, 2019b; Cleetus et al., 2015). These frontline communities are often forced to live in isolation, without resources to address environmental consequences. This lack of resources means that community members often cannot take steps to protect their homes, afford insurance that could help cover losses, or evacuate or relocate (GCC, 2020; NAACP, 2019; Cleetus et al., 2015; Cutter et al., 2012).

Figure 2. Photo Credit Karl Dudman. Down East Community, Carteret County, North Carolina

As noted by Hardy (2017), the colorblind approach taken by government institutions and adaptation planners has failed to design strategies that acknowledge the community's past history, background, and needs, which often leaves them without access to public resources. Additionally, members from climate justice communities have often been excluded from the decision-making process of policies and programs

that might benefit them (GCC, 2020; Miller-Hesed et al., 2020; Cleetus et al., 2015). Lack of involvement in the decision-making process has increased the public's distrust in the government and has contributed to communication and engagement issues between climate justice communities and government agencies (GCC, 2020; Miller-Hesed et al., 2020; USDN, 2017). Though less responsible for climate change, frontline communities continue to disproportionately bear environmental burdens, and their voices are very often ignored (Trayler-Smith, 2017).

II. Risk Perception

To fully understand an individual's or community's response to a risk, it is important to first

understand their perception of risks. Morrow (2008) argues that risk is a social construct, and perception is the core issue. Motivation to act is influenced by risk perception, event probability, severity, and perceived self-efficacy to take action (Morrow, 2008). To achieve effective risk communication, it is important to understand that risk means different things to different people. Climate change risk perception research has found that greater scientific understanding does not always lead to greater public concern (Akerlof et al., 2017; Cutter et al., 2012). Similar to climate change communication, sea level rise risk communication presents challenges involving complex science, uncertainty, and invisibility (Covi and Kain, 2015).

Despite being the most affected by climate change, marginalized groups are typically perceived as the least concerned by large segments of the U.S. public (Egland and Kelley, 2020; Pearson et al., 2018). Stereotypes from outsiders suggesting these communities cannot be seen as environmentalists may pose a barrier to public engagement by discouraging them to be involved in environmental initiatives (Pearson et al., 2018). It is important to note that minority status, economic disadvantage, and weak social support structures are not necessarily synonymous. It is possible for economically disadvantaged populations or communities to have a strong social support structure. Although systems with strong social support are important for helping to reduce vulnerability to hazards, this cannot be achieved without the public willingness to perform. For this reason, it is important to understand different barriers that prevent these communities from taking action.

Barriers are defined as obstacles that can be addressed with concerted effort, creative management, change of thinking, prioritization, and related shifts in resources, land uses, institutions, etc. (Moser and Ekstrom, 2010). What an individual or group of individuals will do depends on what they think they can do and what they want to do. Described below are some of the major impediments for risk communication, particularly with underserved groups.

ii. Trust and Credibility

Lack of trust among low-income and minority populations toward government agencies may be a barrier to traditional risk communication systems, limiting their effectiveness and leading to an unstable information environment (GCC, 2020; Miller-Hesed et al., 2020; Rowel et al., 2012). Siegrist and Cvetkovich (2002) report that when the public has low knowledge about the risk situation, trust plays an important part in public perceptions about the severity of that risk. Trust and credibility for effective

communication depend on whether the message recipient perceives the message source as trustworthy and believable (Meredith et al., 2008). Past experiences with discrimination and abuse have resulted in frontline communities being skeptical of "outsiders" and "experts" (GCC, 2020; Miller-Hesed et al., 2020; USDN, 2017).

It is therefore necessary to frame messages in a way that is relevant to them, and/or to partner with local trusted organizations (Rowel et al., 2012; Agyeman et al., 2007). Governments are often perceived to have failed to maintain promises and provide accurate emergency response plans. This continues to create distrust of government agencies by marginalized communities. It is important to highlight that without the right messenger, even the most well crafted risk messages will go unheard (Moser, 2009). Approaching the public without a relationship or a connection in the community can do more harm than good. Acknowledging past mistakes and oversights by government agencies is a step to address distrust and communication issues, but sometimes it is necessary to partner with local organizations (e.g., neighborhood organizations, grassroots organizations, faith-based organizations) within the community to increase the sense of trust (GCC, 2020; Miller-Hesed et al., 2020; NAACP, 2019; Miller-Hesed and Paolisso, 2015; Rowel et al., 2012). Successful risk communication takes time and effort. Consistent engagement with communities and ongoing sharing of information creates long-term relationships and encourages trust in the messenger, the agency, and in the process (Jurjonas et al., 2020; Plate et al., 2020).

iii. Lack of Knowledge and Communication Techniques

It is crucial for residents in underserved communities to fully understand the hazard of extreme events under current and future sea levels. A lack of scientific knowledge regarding a problem influences the understanding of the risk (Covi and Kain, 2015; Moser, 2009). Therefore, successful adaptation and resilience measures for coastal communities depend upon good communication (Feldman et al., 2016; Morrow, 2009; Moser, 2009; McComas, 2006). Even though the topic of sea level rise perceptions has been minimally explored compared to episodic floods, human behavior related to the risks of chronic sea level rise remains largely unknown (Khan et al., 2020; Jurjonas et al., 2020; Bhattachan et al., 2018; Akerlof et al., 2017), and past research has shown the need for better education and outreach (Bhattachan et al., 2018; Covi and Kain, 2015). A study with a low-income Black community in Wilmington, Delaware, showed that although the group believed sea level rise was a "very serious" problem for the community, they also expressed little to no knowledge of the subject (Perez and Egan, 2016). The population expressed that while being aware of the threat of sea level rise, they had more pressing issues, such as unemployment, education, crime, and adequate housing. Another study with a rural low-income community in North Carolina revealed that participants' concerns about sea level rise were high despite little understanding of the science behind the problem, or the potential solutions (Jurjonas and Seekamp, 2018). In each of these scenarios, the communities were concerned about sea level rise and the associated risks. However, they were not armed with the knowledge of the causes of sea level rise or potential solutions. It is therefore essential to understand the residents' level of expertise in the subject to frame an adequate communication system (Covi and Kain, 2015).

A vital step then would be to create an adequate understanding of the problem in a way that is communicated as an opportunity for empowerment in the community (GCC, 2020). Information on climate change and sea level rise can be translated from a scientific level to language that is more easily understood (Khan et al., 2020). Those who do not understand the impacts from rising sea levels could exacerbate the effects of extreme water levels (i.e., tides, waves, surges) via maladaptive solutions (e.g., bulkheads) or uninformed building (e.g., building below recognized future flood levels), or the lack of knowledge may create a sense of acceptance or resignation, and may cause people to underestimate the risks (Covi and Kain, 2015). In addition to information on climate change, communities need information on how it will affect them, and the different resources available to assist them (FEMA, 2019). The lack of knowledge of local adaptation options could also lead to feelings of powerlessness among marginalized populations.

Conventional risk communication efforts are often not designed for people living in underserved areas (Agyeman et al., 2007). Most of the traditional risk communication systems are designed for a general audience, not taking into consideration that residents in underserved areas may understand risk messages differently (GCC, 2020; USDN, 2017). This can result in parts of the population not understanding the message or distrusting the messenger, leading to risk communication failure. To be most effective, risk messages should be communicated in unique and specific ways that relate to concerns, circumstances, and cultural perspectives of the communities in question (Agyeman et al., 2007).

iv. Mental Models and Emotional Responses

Mental models work as internal explanations or thoughts on how something works in the real world, and are thinking tools used to make decisions, influencing perception and behavior. They are frameworks for thinking, to simplify complex things and reason through them (Shapiro, n.d). Everybody has mental models. They are formed over time, through experiences and social interaction (Morrow, 2009). For example, supply and demand is a mental model to help understand the concept of economy. Although they are useful simplifications, they can also misguide people's understanding of risks. For example, some people can perceive increased global mean temperatures as something pleasant (Helgeson et al., 2012).

Individuals learn about climate change impacts in one of two ways, and typically through a combination of both: through indirect and mediated forms of communication from others (e.g., the media, peers, neighbors, community members, staff, teachers) or directly, through experiencing changes in the environment (Moser, 2009). Recent research and diverse authors argue that secondhand experience (information) is less likely to produce action than direct knowledge (experience) and social interaction (Harvatt et al., 2011; Morrow, 2009). Harvatt et al. (2011) imply that previous risk communication approaches have failed because, in the past, risk communicators remained focused on education rather than engagement in the decision-making process. The combination of both is what forms the mental models. It is important to consider how people understand and form mental representations of sea level rise; these mental models explain and can predict behavior (Helgeson et al., 2012; Morrow, 2009). Effective risk communication begins with a deep understanding of the mental models of the audiences that will be analyzed (Thomas et al., 2015). Understanding mental models can help to address the gap in how experts and non-experts interpret issues in different ways (Akerlof et al., 2017).

Based on this approach, a study was conducted to understand public perception of sea level rise on the Severn Estuary, an ecologically sensitive area in the United Kingdom (Thomas et al., 2015). Experts' and non-experts' mental models were similar in some areas, but the non-experts, despite having experienced consequences from sea level change, did not think sea level rise was a matter of large concern. The reason for this behavior can be tied to the poor or deficient use of mental models. While residents from the estuary experienced consequences associated with sea level rise, they still believed these impacts were caused by something else.

Deficient mental models can lessen the perceived risk and, in consequence, prevent people from taking action (Helgeson et al., 2012). Previous research of mental models in sea level rise shows that a large part of the population is still uncertain about the science and the understanding behind sea level rise (Akerlof et al., 2017; Thomas et al., 2015; Helgeson et al., 2012). Comparing mental models between experts and non-experts within the community leads to understanding gaps or uncertainties in sea level rise. Also, learning about the mental maps in the community can help communicators to better understand the language/vocabulary, existing connections, values, etc. that can be further used to tailor messages.

The way the risk message is delivered is very important. Communication is more effective when there is a balance between providing accurate information and delivering it in a way that does not cause panic or anxiety (Akerlof et al., 2017; Covi and Kain, 2015; Moser, 2009). Sea level rise messages invoking fear or guilt may cause people to turn away from the conversation, while messages that acknowledge the fear but focus on possible solutions can increase people's willingness to learn and participate in the solution-planning process (Barisky, 2015).

Psychological defense mechanisms, such as optimism (i.e., thinking sea level rise effects will not affect them), denial, or avoidance, have been cited as barriers toward engagement (Covi and Kain, 2015; Moser, 2009). These kinds of emotional responses may decrease through the use of tailored visualization tools that help make the concept seem more tangible (Plate et al., 2020; Cutter et al., 2012; Barisky, 2015; Moser, 2009). Visualization tools need to be tailored to the unique mental models, cultural aspects, and educational specifics of the community.

One successful way to avoid these kinds of emotional responses and deficient mental models is to communicate risk on an asset-based, rather than a problem-based, approach. An asset-based approach focuses on the strengths and skills of the community and can be used for problem-solving (Agyeman et al., 2007). The first step in this approach is to recognize what makes the community strong, not looking at what they need but rather what they have. This is achieved by asking questions and learning about the community's and its members' unique stories (TED, 2011). Motivations to act can be discovered from these stories, and an asset mapping can be conducted. An asset map should include tangible (e.g., parks, churches) and intangible (e.g., experiences, skills, knowledge, passions) resources from the community (Glasgow Center for Population Health (GCPH), 2012). The mapping process is intended to increase knowledge and enhance new connections, relationships, and possibilities between individuals, and between individuals and organizations (GCPH, 2012). Regardless of the method employed to communicate risk, it should be channeled to increase empowerment within the community.

III. Risk Behavior

Compared to episodic floods, human behavior related to the changes from sea level rise (often a chronic, long-term impact) remains largely unknown (Jurjonas et al., 2020; Khan et al., 2020; Bhattachan et al., 2018; Akerlof et al., 2017). Having an accurate perception of the risk does not always lead to or ensure effective prevention, mitigation, or defensive action (Morrow, 2009). Risk information needs to be followed with actionable guidance so people know how to act (Campbell et al., 2020). Actions and behaviors depend not only on how the risk is perceived, but also by understanding how people make decisions about those risks. Morrow (2009) tells us the risk-decision process can be broken into four steps: perceiving the situation, considering possible courses of action, considering which is in your best interest, and taking action.

After the situation is perceived, people will assign a level of risk to decide if it is acceptable. According to the expected value theory, benefits and costs need to be analyzed to decide which scenario is the most acceptable option. Often, the chosen option will be the one that has more benefits.

Underserved and underrepresented communities experience numerous challenges that can affect their ability to respond to climate change hazards such as sea level rise. These challenges may include language and cultural barriers, lack of knowledge of the hazard, limited social networks, access to fewer resources, marginalization, and inadequate familiarity with local organizational structures that provide disaster support (Miller-Hesed et al., 2020; Cleetus et al., 2015; Miller-Hesed and Paolisso, 2015). A combination of these barriers can limit a community's ability to respond to a hazard. While past experiences can increase the capacity to address coastal hazards through traditional knowledge, sea level rise is still a novel phenomenon for many communities.

v. Cultural Risk Theory and Traditional Knowledge

Established in 1983 by anthropologist Mary Douglas and political scientist Aaron Wildavsky, the cultural risk theory emphasizes the importance of the cultural context in which risk perceptions are formed (Douglas and Wildavsky, 1983). The human sense of belonging is often tied to cultural adherence and social learning. Cultural risk theory aims to explain how involuntary decisions are made based on surroundings associated with different ethnicities (Mullins and Soetanto, 2013; Morrow, 2009). Furthermore, cultural values can influence how people respond to climate change, and the likelihood of a pro-action behavior (Mullins and Soetanto, 2013).

Communities are often their own experts; residents know what is needed and how to care for themselves and for others in the community (Egland and Kelley, 2020). Land attachment, cultural traditions, historical identity, and local heritage are often key factors that can motivate community capacity-building. Indigenous societies and rural communities have experienced changing and extreme climates for generations, and possess valuable knowledge about an environmental change that is well embedded in cultural, social, and subsistence systems (Mercer et al. 2008). Experiential community knowledge is a valuable tool for developing the most effective ways to mitigate the potential effects of sea level rise and flooding (Jurjonas et al., 2020; Perez and Egan, 2016). While cultural and social influences are not the only

determinants for risk behavior, they do play an important role. Experiential and traditional knowledge within these communities need to be respected and should be used when addressing risk factors and communication.

IV. Risk Communication

Risk communication is broadly understood as an iterative exchange of information among individuals, groups, and institutions related to the assessment, characterization, and management of risk (McComas, 2006). The information and the process of communication are both vital in communicating climate change risk. While the public can perceive climate change as occurring, many people are still unclear about causes and solutions, and, in many cases, see the effects as distant in time (Covi and Kain, 2015; IPCC, 2014). Sea level rise communication, just like climate change communication, can be challenging due to the intangible nature of the phenomenon (Khan et al., 2020; Covi and Kain, 2015). It is hard to communicate a low probability weather event, but it is even harder to communicate an "invisible" climate effect such as sea level rise, even if the impacts may be catastrophic (Akerlof et al., 2017; Covi and Kain, 2015).

Coastal communities often do not have communication and/or engagement tools available to help their residents understand the threat of sea level rise (Akerlof et al., 2017). People living in underserved areas are often hard to reach due to the lack of systematic relationships between the government and these communities (GCC, 2020; Cleetus et al., 2015). Risk communicators need to bridge the gaps between the scientific and public understanding of risk and provide a process to address the concerns of both parties (Covi and Kain, 2015). Adrienne Hollis, an environmental justice expert, states that when working with frontline communities, the most important guideline to follow is that communities should speak for themselves (Stovicek, 2019). Historically, frontline communities have not been granted a space where they can share their opinions and knowledge on sea level rise (Stovicek, 2019). Frontline communities need to have a word on what they have experienced firsthand. Despite reporting high levels of environmental and sea level rise concerns, people in underserved areas are often perceived as least concerned in environmental threats by large segments of the U.S. public (Egland and Kelley, 2020; Pearson et al., 2018). Climate change and environmental knowledge often come from personal experiences, observations, and research (Khan et al., 2020; Plate et al., 2020; Miller-Hesed and Paolisso, 2015). Community members have useful information that can help improve the site characterization and the knowledge of the community's needs; they have lived in the region for generations and they know their land (Egland and Kelley, 2020). Those who suffer the greatest consequences of climate change are often those with the greatest lived knowledge, yet their perspectives are frequently undervalued. (Vickery and Hunter, 2016).

vi. Communication Mediums

Climate change and sea level rise information can be very technical and difficult to interpret for people who are not familiar with the subject, causing misunderstanding and misinterpretation. Although some studies support the use of charts, graphs, and maps to communicate sea level rise (Plate et al., 2020; Akerlof et al., 2017), these studies are traditionally not focused on frontline communities and do not take into account cultural and educational factors that influence the effectiveness of these communication

tools. Campbell et al. (2020) determined that among marginalized populations, maps and graphs are less intuitive and impactful, and that overall, community members prefer photographs and illustrations. Visuals that are local, place-based, and familiar help change the idea that climate change is a distant phenomenon, and also facilitate audience participation (Akerlof et al., 2017; Barisky, 2015). Wadey et al. (2015) reported increased engagement and concern in sea level rise effects using visualization tools such as coastal flooding simulations.

Research within the community can help identify communication preferences and trusted sources. For example, different studies (Moser, 2009; Plate el al, 2020) found TV meteorologists are often viewed as trusted sources and play a large role in the decision-making process. Age may also be a factor in the preferred method of accessing resources for adaptation. Current means of information distribution used by government and non-government agencies rely on radio, television, newspapers, and the internet. The use of the internet in underserved communities has increased in recent years, and could increase the chances of reaching them (Campbell et al., 2020; GCC, 2020). Nonetheless, special attention needs to be taken when using the internet as a way to communicate risk, since many residents do not have access to internet services or may not be familiar with the use of this non-culturally traditional method.

a. Social Media

In recent years, social media has emerged as an important risk communication tool. Government agencies use internet-based applications as an effective method for the sharing of formal and informal sources of information, including flooding advisories and resources to diverse audiences (Feldman et al., 2016). Instagram, Twitter, Facebook, and other social media platforms play an important role in risk communication for preparedness, response, and recovery (U.S. Homeland Security, 2018). It is notable that in this environment, false information can be spread rapidly, but social media is also a nimble tool that allows for quick, informal responses as compared to a traditional press release. Some federal agencies in recent years have used social media to debunk rumors and clarify false information (U.S. Homeland Security, 2018). Although the use of social media to communicate climate hazards has been increasing (NAACP, 2019; EPA, 2016; Feldman et al., 2016), not everyone has access to reliable internet and/or social media for various reasons. Therefore, social media should not be the only method used to communicate or engage with the public.

vii. Community-Based Engagement

Risks are shared and experienced collectively within communities. People often look for help, guidance, and information from their social networks and may rely more on these networks rather than on official communication (Harvatt et al., 2011; Meredith et al., 2008). Interaction with the community can help smooth risk communication processes. Community-based adaptations to climate change use a bottom-up approach to ensure that implementation strategies consider communities' needs (Plate et al., 2020). The process of community-based engagement should be based on and guided by the needs, knowledge, and capacities of communities to plan for and adapt to sea level rise impacts (Khan et al., 2020).

Reaching frontline communities where they are located is important in effective risk communication. People from underserved communities are less likely to attend state or local meetings because of the lack of enough advance notice, transportation, childcare, and limited time off. It is therefore essential for risk communicators and outreach professionals to engage at the local community level (GCC, 2020). Examples of community engagement efforts include workshops, focus groups, meetings, and online forums. One strategy for promoting engagement is to emphasize small group discussions and interaction; community members may feel intimidated in large public meetings with formal discussions (EPA, 2016). Group work encourages participants to remain engaged and promotes collaboration (Jurgonas and Seekamp, 2018; Plate et al., 2020).

b. Tailoring Messages for Residents in Underserved Areas

When working with residents in underserved areas, it is crucial to tailor messages to the specific communities' needs, priorities, and knowledge level on sea level rise. Tailoring messages to each community is resource-intensive, and many government agencies are not trained in messaging for specific populations (Meredith et al., 2008). Communicators should use non-technical information, as highly technical information can lead to misunderstandings and difficulties in the trust-building process (Campbell et al., 2020; NAACP, 2019; Meredith et al., 2008). Even within the same community, messages may need to be tailored. For example, messaging for older adults or people who may not speak English may be needed (Meredith et al. 2008).

Recently, government agencies have tried to be more thoughtful in their communication and engagement programs with people in underserved areas (FEMA, 2019; EPA, 2016). While the Environment Protection Agency (EPA) spreads disaster information in different languages and formats, people in underserved areas have reported difficulties in accessing appropriate information, services, and support (FEMA, 2019; Miller-Hesed and Paolisso, 2015; EPA, 2013; Rowel et al., 2012). In January 2019, the Federal Emergency Management Agency (FEMA) created "Building Cultures of Preparedness: A report for the emergency management higher education community." The document follows a bottom-up, culture-based approach and attempts to enhance levels of preparedness among individual households, communities, and various organizations outside the emergency management agency. The report proposes four guiding principles: 1) Developing trust by understanding the culture, context, and history of communities outside the context of disaster; 2) Bringing the cultural perspectives of all stakeholders to the table; 3) Acknowledging how the different stakeholders carry their own cultural norms and act with their own culturally embedded assumptions; and 4) Supporting local practices around the ways people are already prepared and enhancing these efforts using culturally aware strategies. The report highlights good points, such as the use of a bottom-up approach and the inclusion of local voices in the decision-making process, but lacks information on long-term (chronic) weather events.

Designing guides to approach frontline communities with underserved populations does not necessarily require creating a new set of rules to communicate with, but rather adapting existing guides to include a particular community's needs and knowledge level. An example is a guide prepared by the Natural Hazards Center at the University of Colorado Boulder to communicate the disaster life cycle for people living in underserved areas. The goal of the guide is not to create a new set of rules to communicate with

vulnerable populations, but rather to prove that general, widely accepted rules for risk communication can be adapted and used for working with residents in underserved communities. This guide suggests the use of three overachieving principles (Campbell et al., 2020): 1) Communicate through familiar and trusted messengers; 2) Provide clear, actionable information; and 3) Tailor message and information pathways for target audiences. Methods for delivering risk messages include visual tools, social media, television, radio, newspapers, focus groups, workshops, and storytelling groups.

The EPA is also aware of the importance, challenges, and differences in engaging with underserved populations. As a way to motivate other agencies to consider and incorporate environmental justice as part of their methodologies, the Federal Interagency Working Group on Environmental Justice and the NEPA Committee created "Promising Practices for Environmental Justice Methodologies in NEPA Reviews" (EPA, 2016). Although the report was not designed to serve as a formal guide, it does provide a series of recommendations through different categories to improve agency-community relationships. Recommendations include early engagement with the community, establishing community advisory committees, creating ways to receive inputs from residents, exploring non-traditional communication methods such as social media, online forums, and webinars, making information readily available, and encouraging communities to propose their own alternatives.

Also trying to address the challenges of translating complex climate science into policy and actions, Khan et al., (2020) created a framework called COREDAR ("Communicating Risk of Sea Level Rise and Engaging Stakeholders in Framing Community-based Adaptation Strategies"). The authors propose a step-by-step checklist approach to communicating the complex science of sea level rise in a simplistic way that engages diverse stakeholders in urban and rural community-based engagement and decision-making processes. Steps in the checklist include identifying vulnerable communities and stakeholders, communicating sea level rise risk, framing community-based adaptation strategies to sea level rise, and mainstreaming community-based adaptation strategies. Each one of the steps has its own data recording sheet to help guide the process and interpret the results.

As stated by multiple authors (Campbell et al., 2020; GCC, 2020; FEMA, 2019, EPA, 2016; Barisky, 2015; Meredith et al., 2008), the step-by-step approach emphasizes the use of appropriate framing, compelling visuals, and accessible language to effectively communicate sea level rise, as well as the importance of engaging frontline communities in the planning process of appropriate adaptation strategies to sea level rise at the local level of the given coastal region

c. Inclusion of Local Voices

It is important to note that most current climate change communication plans do not address or consider the needs of frontline communities (GCC, 2020; Plate et al., 2020; California Coastal Commission, 2019). The Georgetown Climate Center (2020) advises that equity and resilience require investment in the implementation of programs and policies requested by communities. These programs should address climate change and sea level rise concerns, as well as other daily challenges, such as health, household, education, transportation, economic finances, and gentrification. The goal of involving communities is to facilitate information exchange and processes that enable communities to understand potential

problems, evaluate future risks, identify reasonable options, and develop adaptation actions in response to changing environmental conditions (Moser and Ekstom, 2010). Enhancing self-determination and self-governance in frontline communities fosters education and empowers communities to take action against sea level rise hazards (Kehaulani Watson-Sproat, 2020).

A successful example of incorporating local voices in the decision-making process is the West Kaua'i Community Vulnerability Assessment. The assessment was developed by the University of Hawai'i Sea Grant College Program and the Department of Urban and Regional Planning, and was completed with the help of the Vulnerability, Consequences, and Adaptation Planning Scenarios (VCAPS) process. The report presents profiles of assets, facilities, and resources identified by the community as management concerns. It describes vulnerability to three primary coastal hazards: coastal erosion, passive flooding, and annual high wave flooding. Through a series of workshops, community members and asset and resource managers engaged in dialogue about current and future weather and climate threats and summarized their specific local knowledge and experience about how the community could be impacted. These workshops were open to all members of the community. The use of the VCAPS process and the inclusion of local voices in the assessment led to a better understanding of the risks within the community. VCAPS is open-source technology and freely available, but it has some limitations. This is a time-consuming and labor-intense process and trained facilitators are needed for its application. Many times residents in underserved communities do not have the financial resources or time to do this, so it is essential to plan a schedule and budget considering these factors.

Hiring someone from the community can also help establish community-agency relationships. Cultural brokers or community leaders are respected figures in the community with the ability to bridge gaps by bringing people together (GCC, 2020; Jurjonas et al., 2020; Plate et al., 2020; FEMA; 2019; Rowel et al., 2012). Recruiting these individuals can help outside organizations and local communities connect, build trust, and share knowledge (FEMA, 2019; Jurjonas and Seekamp, 2018). Traditional leaders, church leaders, youth and women's group leaders, school teachers, and other influential figures can act as facilitators and 'cultural translators," educating others in the community about sea level rise by connecting scientific concepts with traditional and local knowledge (FEMA, 2019; Rowel et al., 2012). Characteristics of cultural brokers include knowledge, expertise, and leadership within the specific social group. These leaders can be identified by networking in the community (Campbell et al., 2020; Plate et al., 2020). The use of agreement contracts or memoranda of understanding is highly encouraged to avoid misunderstanding among all parties (Stovicek, 2019 and Rowel et al., 2012).

d. Incorporation of Local Practices

Oftentimes, decision-makers communicate plans with the community when the process is almost completed. Trust and collaboration can be earned more readily when the community's opinions are considered in the decision-making process and when they are engaged starting at the beginning of the planning process (Campbell et al., 2020; Jurjonas et al., 2020; Khan et al., 2020; Plate et al., 2020; GCC, 2020; EPA, 2016; Covi and Kain, 2015; Hesed and Paolisso, 2015; Morrow, 2008).

An article made in partnership with the First Nations Development Institute acknowledges the importance of incorporating local practices in the community engagement process (Kehaulani Watson-Sproat, 2020). The article suggests building community capacity by teaching and allowing communities to identify their own solutions to problems without relying on external resources. Providing jobs in the fields of natural and cultural resource management gives young people opportunities to partake in meaningful work in their own communities.

Youth and older adults are frequently harder to engage (Campbell et al., 2020). In order to increase youth population participation in climate change adaptation measures and to create connections between different age groups, researchers in the Solomon Islands organized a photo-film contest. Participants interviewed and recorded the elders talking about the changes they have seen and offering advice for facing these changes, including local practices and techniques from the past (traditional knowledge) that they could pass on. The youth then took photos of their communities, and the things they thought best represented their life in order to complement the elders' stories. The final film was shown at the Festival of Pacific Arts. This activity was received with enthusiasm and was a successful way to increase the youth's interest in climate change adaptation (Abernethy et al., 2012).

Achieving environmental sustainability with frontline communities is only possible by restoring and maintaining ancestral places and practices (Kehaulani Watson-Sproat, 2020). Climate justice communities across the U.S. frequently have had outsiders deplete their resources and commercialize their natural landscapes, thereby minimizing their incomes, services, and opportunities to focus on chronic issues as they are immersed in moving from one emergency to the next. It is therefore essential to restore connections between residents and the natural resources to which they trace their genealogies (Kehaulani Watson-Sproat, 2020).

e. Partnerships with Local Organizations

In North Carolina, programmatic efforts in resilience have historically not engaged with organizations that interact day to day with frontline communities, such as public schools, social service, healthcare providers, houses of worship, faith-based organizations, and public transit systems (NCDEQ, 2020). This finding is also supported by Rowel et al. (2012), who found that grassroots organizations have largely remained an underutilized resource for state and local health departments and emergency management agencies. This is partly because of the lack of pre-existing relationships with these organizations, as well as the lack of well-planned programs and agreements prior to emergency situations.

To help address this challenge, the authors created "A Guide to Enhance Risk Communication Among Low-Income and Minority Populations." This guide details principles to begin community engagement efforts, including being clear about goals and objectives with the residents, gathering knowledge of the community's history (e.g., reading online articles and books, attending town-hall meetings), promoting self-efficacy, partnering with local organizations, and recognizing and respecting the community's diversity.

Grassroots organizations have a long history of working with frontline communities and are more likely to understand the specific needs and challenges of these communities. The Greenlining Institute (2019)

proposes the use of a community engagement plan to enhance communication with at-risk communities. The guide suggests that at a minimum, community engagement plans should include a description of key stakeholders and local organizations serving in the area, a history of residents' engagement, a clear timeline, a list of roles and responsibilities between the community and the communicators, a list with the residents' needs and concerns, and information on how the public will remain informed.

Ethnic minorities are often socially and culturally bonded by worship and fellowship (Miller-Hesed and Paolisso, 2015; Jurjonas et al., 2020). Religion plays an important role in many communities. A large number of Black and Hispanic communities attend church regularly or are connected to the church through family and friends (Miller-Hesed et al., 2020; NAACP, 2019; Miller-Hesed and Paolisso, 2015). In the absence of trust in federal and state agencies, faith-based organizations like churches can provide important communication channels.

A study conducted in the Eastern Shore of the Chesapeake Bay showed that community members consistently rely on family and friends for information related to climate change. The study emphasized the importance of the social and political isolation of three Black communities that prevented them from taking action on collaborative adaptation measures against flooding from sea level rise (Miller-Hesed and Paolisso, 2015). A follow-up study was conducted as a way to bridge the gap between rural Black communities and government agencies, and by engaging faith-based communities in coastal resilience. Twelve members from churches in Maryland were recruited. Collaborative learning activities were tested through interviews, workshops, and community meetings. The study confirmed that collaborative learning between churches and government increased the understanding of capacities and limitations in addressing environmental challenges, increased trust and social networks, expanded engagement with a greater diversity of stakeholders, increased opportunities for new conversations, and enhanced stakeholder empowerment. Limitations in this process were time and effort, specialized language, identifying common goals, grappling with the newness of climate change, and overcoming institutional barriers. The collaborative learning process overall improved trust between stakeholders and church members who expressed interest in continuing collaborations to address environmental challenges (Miller-Hesed et al., 2020).

viii. Trainings, Just Compensations, and Budgets

Research shows that training of individuals delivering risk messages can increase trust in stakeholders (GCC, 2020; EPA, 2016; Meredith et al., 2008). Multiple authors advise providing a base level training on equity and environmental justice for the project team involved in the risk communication and engagement project (GCC, 2020; California Coastal Commission, 2019; EPA, 2016). To achieve adequate training for agency staff, third-party consultants can help develop different skills to understand how to talk about racial equity and implement equity principles during community engagement and decision-making (GCC, 2020). Financial support for community members leading and participating in the community engagement processes is also suggested by others (GCC, 2020; Perez and Egan, 2017; Clark et al., 2007). Compensating community members for time and effort expended has been shown to increase the number of participants and the level of engagement in community-based events.
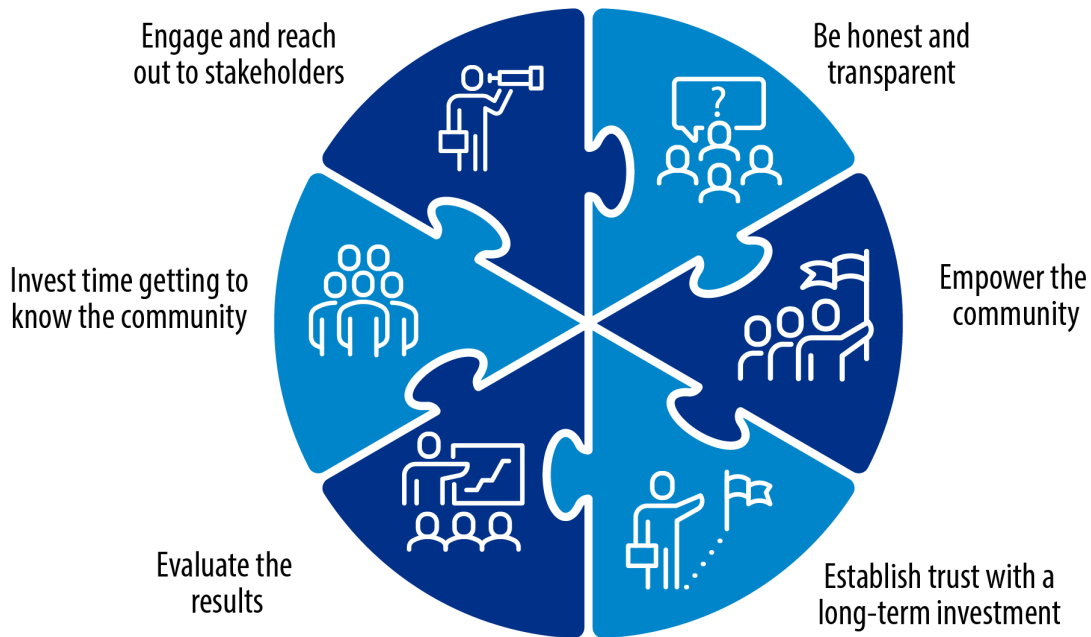
For this reason, budgeting is a key element to ensuring success in the process of risk communication and building community resilience. It is important to recognize that community participants bring their own set of expertise and experience to projects and that they should be compensated fairly for their contributions. Dedicated funding for residents in underserved communities and chronic sea level rise projects can open doors for more equitable engagement and future community-driven efforts. Furthermore, community engagement projects should also be considered high priority in local, state, and federal government budgets at the outset of climate adaptation initiatives (GCC, 2020; Miller-Hesed et al., 2020). To give communities a voice in the decision-making process, the Georgetown Climate Center (2020) proposed the use of participatory budgeting processes where residents have the opportunity to share how they would like to see funding spent in their neighborhoods.

V. Best Practice Recommendations from the Literature Review

Commonalities found in the review of different case studies, research papers, and past recommendation guides have resulted in best practice recommendations. These recommendations reflect recent efforts to effectively connect and communicate with residents in underserved frontline communities. It is important to note that all communities are different, and therefore, further activities, such as the engagement summarized in the subsequent section, is needed to address specific communities' needs and concerns. These recommendations are intended to serve as the first step towards communication and engagement. They provide an overview of actions and considerations for NOAA funders and practitioners to improve communication and engagement with residents in underserved communities.

1. **Invest time getting to know the community**. Understanding the local context is a key step in the risk communication process (GCC, 2020; Campbell et al., 2020; The Greenlining Institute, 2019; Miller-Hesed and Paolisso, 2015;Rowel et al., 2012). Risk communicators need to become educated about the target community's culture, beliefs, norms, social networks, and languages. Learn the terminology the community is comfortable with and use to refer to themselves. Also, communicators should learn and understand the community's history, know details of their past relationships with federal agencies, and identify the community's values and concerns related to sea level rise. Information about the community's background needs to be known beforehand. It is not the responsibility of the community to educate risk communicators on their history. Communicators can look for this information through different sources like online resources, articles, and books. Communities may have participated in prior community-engagement processes that were not successful, creating feelings of exclusion.

Best Practice Recommendations

Engage and reach out to stakeholders

Be honest and transparent

Invest time getting to know the community

Empower the community

Evaluate the results

Establish trust with a long-term investment

a. Funders

   i. Develop funding timelines and milestones that allow for this kind of work on the front end of project timelines.

   ii. Build in time for collaborative project development and partnership with the community by allowing for longer funding application periods (i.e., the time between opportunity announcement and proposal submission deadline).

   iii. Encourage background information on communities to be included in proposals and encourage partnership with organizations already working in the community.

   iv. Give extra weight to proposals that demonstrate a clear existing (preferably long-term) relationship with a community and in which community representatives play a leadership role.

2. **Engage with and reach out to stakeholders**. Information gaps may originate from inadequate outreach. Outreach to build knowledge is critical in the risk communication and adaptation process (Jurjonas et al., 2020). Meeting with stakeholders in comfortable and familiar places can help address trust and cultural gaps (The Greenlining Institute, 2019). Risk communicators need to go to the communities, identifying local leaders and potential trusted spokespersons. Meet with community members at times and places that are convenient for them. Consider hiring a cultural broker from the community to lead the risk communication process, as it can increase participants' trust as well as the success of the project (Jurjonas et al., 2020; Miller-Hesed et al.,

2020; Rowel et al., 2012). Explain locally relevant and observable impacts, propose community-driven solutions, and stress the benefits of community engagement. Risk communicators need to resonate with the community's cultural practices and traditions (Kehaulani Watson-Sproat, 2020). Communicate with respect to pre-existing values and beliefs. Let the community speak and reveal their opinions, fears, and concerns. Use different tools to communicate sea level rise risk, from traditional methods, such as low-tech maps, simulations, videos, pamphlets, and newspapers, to non-traditional methods like storytelling, social media, webinars, and online meetings. Traditional communication methods like face-to-face and in-person outreach may be challenging in the COVID-19 era (GCC, 2020), so the implementation of new non-traditional communication methods may be necessary. Encouraging stakeholders to express and share their first-hand experiences can help others engage in discussions.

    a. Funders

        i. Allow and encourage flexibility in the budget to support community member travel.

        ii. Allow and encourage flexibility in the budget to support hiring members of the community to lead on-the-ground outreach and communication efforts and to provide honorarium to other community members dedicating time and effort to the project.

3. **Empower the community.** Government agencies often inform communities about their decisions and plans, instead of engaging them as decision-makers in the project. Due to historical under-representation and segregation, it is crucial to incorporate these frontline communities in coastal planning decisions and projects that have implications for their neighborhoods and families (California Coastal Commission, 2019). Government agencies need to act as facilitators rather than experts. Frontline communities are their own experts and should be empowered to guide and have a meaningful role in the adaptation process. Be prepared to alter adaptation strategies and approaches based on community feedback. Celebrate the strengths and contributions of the community to build resilience. Provide people with actions they can take in their everyday lives to be part of the solution. As community members become more knowledgeable and empowered about sea level rise, they are more likely to advocate for solutions and play an important role in community-driven engagement. Empowerment of the community will increase people's sense of confidence, self-efficacy, and trust among other community members.

    a. Funders

        i. Celebrate and acknowledge progress through awards–both monetary and non-monetary.

        ii. Include implementation funding in risk communication/resilience awards intended for communities to enact solutions they have developed, which will further increase people's sense of confidence, self-efficacy, and trust, while providing concrete examples of change and solutions.

iii. Provide flexibility for project activities and outputs to adapt to community feedback over the course of project implementation, including flexibility to extend project timelines.

4. **Be honest and transparent.**[6] Clarify and articulate the goals of the project and be clear about the promises and outcomes. Carefully consider the full impact of the project, including potential negative consequences for the community. Keep the community informed throughout the entire process. As the project advances, make new information readily available to them. Creating a clear schedule with timelines, roles, and responsibilities is highly recommended. Accountability is crucial to build and maintain trust with communities (California Coastal Commission, 2019; USDN, 2017). Be honest about what you do not know and create an open space for audiences to share their opinions. Establishing relationship rules and responsibilities can be useful to make sure everyone is accountable from the beginning (Stovicek, 2019 and Rowel et al., 2012). This can be through formal mechanisms, such as memoranda of understanding, or through informal means, such as meeting notes that are reviewed and agreed upon, or other mechanisms. Communication among stakeholders needs to be consistent, clear, and appropriate to their knowledge level.

    a. Funders

        i. This level of communication requires time; therefore, the budget should be inclusive of someone whose purpose is to do this work.

        ii. During the proposal process ask how these issues will be addressed and maintained.

5. **Establish trust with a long-term investment.** Translating knowledge into actions, as well as building trust and community relationships, occurs over a long time period. Familiarity with agencies increases trust and accelerates the planning and implementation process. Timelines and budgets will vary for each community project, but federal and state agencies need to plan realistic timelines that ensure long-term commitment with the communities. Trust relationships also involve flexibility and adaptability to respond to the community's needs. Do not initiate a relationship with a new community if you are not prepared for the level of commitment required to maintain that relationship in the long-term.

    a. Funders

        i. Support targeted efforts that may only build or maintain relationships with one community or neighborhood.

        ii. Fund long-term partnerships (i.e., five years or more) that allow for deeper partnership and the time needed to establish trust.

        iii. Allow for budgets with flexibility so that the project can adapt to meet the needs of the community, as defined by the community.

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6. *In revising this document, the project team felt this recommendation approaches project management from a top-down lens. The intent is to communicate that there needs to be continual two-way dialogue with the community.*

6. **Evaluate the results.** Sharing lessons learned and evaluating the effectiveness of the risk communication process can improve future messaging efforts and opportunities to advance equity (GCC, 2020). Track impacts of communities over time and document any unresolved issues. There has previously been little formal evaluation for risk communication efforts with frontline communities (Jurjonas et al., 2020; Khan et al., 2020; Bhattachan et al., 2018; Akerlof et al., 2017; IPCC, 2014; Clark et al., 2007). Evaluation of risk communication programs and the impact of risk communication efforts is critical, but systematic efforts are currently lacking (Meredith et al., 2008).

   a. Funders

      i. Require formative and summative evaluations of risk communication projects.

      ii. Support sharing among communicators and evaluators so that findings can be translated to the broader sea level rise communication research, practice, and evaluation communities.

VI. Conclusion

This literature review highlights the need to address risk communication related to chronic sea level in a holistic and systematic way that integrates science with a community's needs and knowledge. Effective risk communication is a powerful tool to create more equitable policies, address inequality, and enhance community resilience (GCC, 2020; The Greenlining Institute, 2019; Moser, 2009). Risk communication efforts are often compromised due to strict timelines, tight budgets, and community engagement challenges (Miller-Hesed et al., 2020; Plate et al., 2020; Cleetus et al., 2015; Meredith et al., 2008; Agyeman et al., 2007). As climate change and sea level rise impacts continue to accelerate, efforts need to be taken to prepare and protect the most at-risk communities.

Former adaptation efforts have focused on top-down approaches, with little attention to residents in underserved communities, and as a result have failed to adequately communicate risk to these communities (Khan et al., 2020; Plate et al., 2020; FEMA, 2019). Investing in local leadership is considered essential to connect scientific knowledge with local ways to understand environmental behavior (GCC, 2020; Campbell et al., 2020; Kehaulani Watson-Sproat, 2020; FEMA, 2019; Rowel et al., 2012). Effective risk communication engagement requires the government and communities to work together as equal partners. **The community should guide the process, providing expertise and vision from and for their neighborhoods, while the government provides scientific and technical expertise, as well as implementation support.** True change requires continuous action. Building trust with communities takes a long time and should be approached with sensitivity. Short-term engagement cannot solve all inequalities, but is an important step to relationship-building between frontline residents and risk communicators (GCC, 2020).

Although coastal risk management practices address chronic sea level rise, there is a focus on acute water level extremes, such as storms and extreme weather events (Khan et al., 2020; Akerlof et al., 2017; Covi and Kain, 2015). Public opinion on sea level rise is still in the early stages of development across the

globe (Khan et al., 2020; Jurjonas et al., 2020; Bhattachan et al., 2018; IPCC, 2014). There is a growing body of literature exploring the issues of risk communication for residents in underserved areas, but there is still a need for research addressing the gap between theory and practice. Multiple authors and agencies (Campbell et al., 2020; GCC, 2020; Khan et al., 2020; FEMA, 2019) recognize that there is no "one size fits all" approach for communicating risk and ensuring equity. Each community is different, and therefore each requires a unique approach. Risk communication strategies should be flexible and require adaptation for each community's needs and priorities.

It is important to learn from the past. The 2020 protests for racial justice and police reforms are a reminder of the structural racism that exists in government institutions, resulting in large social inequities. If social and climate injustices are not fully addressed, racism is very likely to prevail (Hardy et al., 2017). Adaptation to sea level rise should encompass equity in the whole process, from risk assessment and decision-making to planning, implementation, monitoring, and evaluation. An equitable process will include community engagement needs in all steps of the adaptation process. Frontline communities have tried unsuccessfully for decades to speak to politicians, policymakers, and environmental organizations, thereby affecting their willingness to share personal experiences with flooding related to sea level rise. Investments in these communities require a long-term commitment to healing the pain from a legacy of injustices.

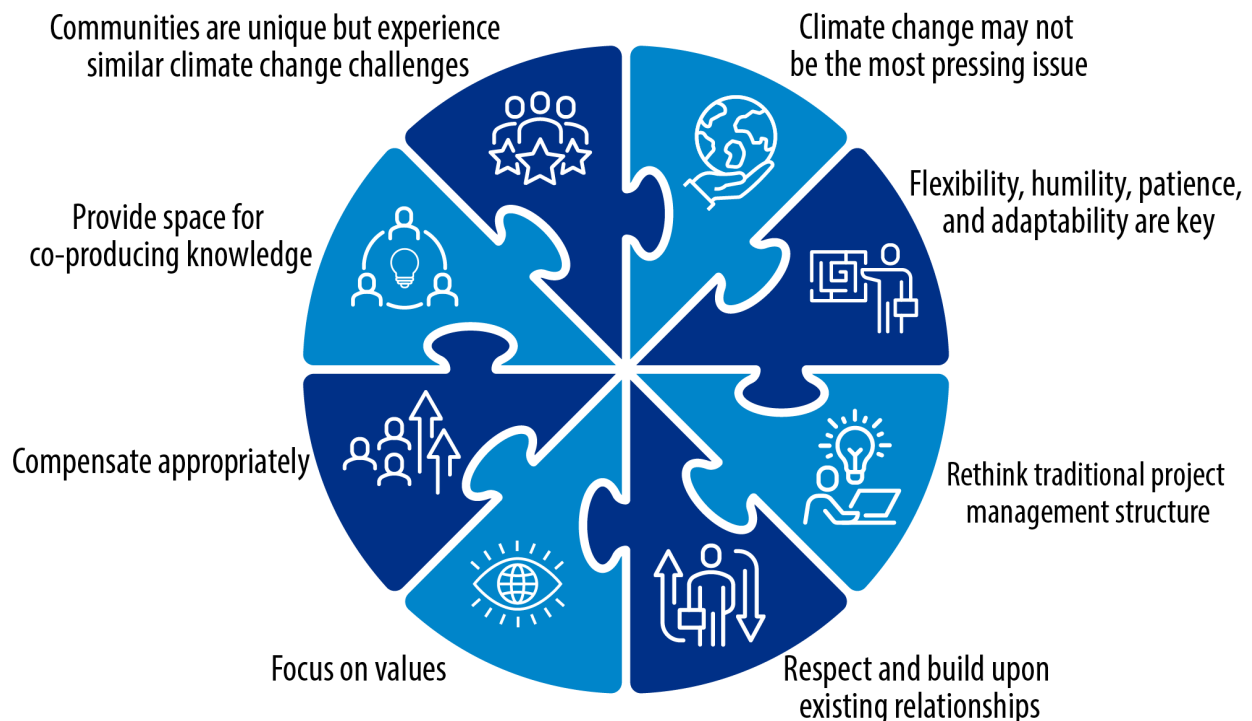*Figure 3. Photo Credit Karl Dudman. Down East Community, Carteret County, North Carolina*

PART II: Lessons Learned from Implementing the Best Practices for Risk Communication

Introduction

Historically, risk communication has too often been disconnected from place, failed to fully and equitably engage communities, and emphasized vulnerabilities over community strength and resilience. As climate change brings increased risk of flooding to coastal communities, there is the growing need for risk communication strategies that address these issues and equitably serve the underserved communities that are often the most vulnerable to coastal hazards.

In this section, we describe the collective lessons learned from applying the best practices recommended in the literature review, including unexpected challenges from COVID-19. The North Carolina, Hawaii, and Mississippi-Alabama Sea Grant programs engaged stakeholders in place-based processes to build trust and community relationships. Their work also sought to integrate local knowledge and experience and to emphasize community strength and resilience in communication around sea level rise, flooding, and storm surge. Ultimately, the goal was to understand how to more fully and equitably engage communities in discussions on the long-term impacts of climate change in order to better meet community needs with tailored risk communication practices and funding.

Lessons Learned

Communities are unique but experience similar climate change challenges

Climate change may not be the most pressing issue

Provide space for co-producing knowledge

Flexibility, humility, patience, and adaptability are key

Compensate appropriately

Rethink traditional project management structure

Focus on values

Respect and build upon existing relationships

Time and funding were two critical resources that posed challenges for all the Sea Grant programs. Building relationships, especially when they must be built from scratch, takes time and money. This second phase of the project revealed the eight primary lessons outlined below.

Lessons Learned

Communities are unique, but experience similar climate change challenges. Sea level rise will affect each geography in different ways. Communities' preferences for engagement, how members of the community interact with each other and with those from outside, and their perception of the issues they face all differ. However, they all face similar climate change challenges. Sea level rise will change coastal communities in North Carolina, Hawaii, Mississippi, and Alabama.

Climate change may not be the most pressing priority for action. Residents in underserved communities are often addressing short-term needs, making it difficult to focus resources on the chronic effects of climate change. Accordingly, if risk communication and pressing community priorities are designed to overlap, there is an opportunity to address multiple challenges. It's important to keep in mind that residents in underserved communities were disproportionately affected by COVID-19, which illuminates that ongoing and new changes will continue to disproportionally affect these communities.

Flexibility, humility, patience, and adaptability are key. Building relationships takes time; therefore, patience is essential. Approaching people with humility will go a long way toward building relationships, especially when there is a history of distrust. Be open to potentially uncomfortable criticism or observations. Be prepared to adapt plans to work around community needs, unanticipated disruptions, and evolving language sensitivities.

Rethink federal project management structure. Budget cycles, project plans, and reporting requirements make us hurry our work to meet deadlines. These structures are not traditionally being built to be responsive to place-based processes and community needs. The conventional structure doesn't always align with community needs, especially related to compensation. Deadlines need to be extended to accommodate trust-building, and institutional culture around funding structures should be examined to determine how these are creating barriers to funding work with residents in underserved communities. Budgets and timelines also need to better account for the money and time it takes to engage with community stakeholders before even getting to a project, as well as to support the project itself.

Respect and build upon existing relationships. Advancing equity and working with residents in underserved communities has become an increasingly popular focus across multiple fields. It's important to take time to identify and understand who is already working in this space and with your communities of interest. Respecting existing social infrastructure and identifying trusted messengers is key. Communicators must be willing to understand the resources and strengths communities already bring to the table, respect local knowledge, and find ways to integrate effectively to add value.

Focus on a community's values. Understand what the community values and use this information to identify the best path forward to engage. Values are pivotal to accountability, trust, reciprocity, and collaboration. A community-centered approach is key to action and community empowerment.

Compensate appropriately. Build in how to adequately compensate people for their time. For example, pay people who help facilitate a workshop. Compensation does not always have to be direct and monetary to an individual. For example, paying for childcare at a public meeting benefits attendees, but is not a direct payment to the participants. Help empower and build capacity, while avoiding implying helplessness or attempting to overhelp.

Center communities as decision-makers. Community-driven initiatives generate longer-lasting results. Be a facilitator who provides technical assistance and support to a community-led process. That is done by taking time and by providing the space to understand community needs and where priorities overlap. Also keep in mind that there are different types of knowledge that are not based on Western science, which can lead to alternate ways for generating solutions. Respect and embrace those differences.

Acknowledgments

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