


How North Carolina Local Governments Respond to and Communicate about Climate Change

By
Jessica Reid

Senior Honors Thesis
Environment, Ecology, and Energy Program
University of North Carolina at Chapel Hill

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Approved: 

Dr. Kathleen Gray, Thesis Advisor

Dr. Miyuki Hino, Reader

Lauren Thie, Reader

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Abstract

As human-caused climate change threatens North Carolina municipalities and counties, local governments can play a key role in reducing municipalities' and counties' contributions to climate change and increasing their resilience to climate threats. This research study aimed to understand how North Carolina local governments communicate with residents about their responses to climate change. The study involved conducting 12 qualitative interviews with sustainability employees in North Carolina local governments. Results were coded and analyzed to find several themes about the ways participants said local governments communicated about climate responses, received resident input, and implemented successful climate initiatives with public engagement. The majority of participants said they framed climate initiatives to connect with what matters to residents, which is a strategy that aligns with Intergovernmental Panel on Climate Change communications recommendations. Misconceptions about climate change that participants heard residents express tended to be about climate responses rather than climate science, which is in contrast to literature about climate change as a polarizing topic. While participants commonly identified funding, metrics, and partnerships as factors for successful climate initiatives involving public engagement, COVID-19 emerged as a barrier for communicating and engaging with residents. The strategies and factors that led to successful initiatives and communication as well as barriers to responding to climate change can inform future local government responses to climate change as well as future research on this topic.

Keywords

Climate responses; local government; communication strategies; resident input; climate resilience; North Carolina

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Introduction

Scientific consensus is that human activities cause global warming and that global warming beyond 1.5 degrees Celsius will have devastating impacts for Earth and its people (IPCC, 2018). Local governments can respond to climate change in different ways to mitigate their own contributions to the problem and adapt to impacts of climate change. They can communicate about climate responses with residents and seek resident input to varying extents and in different ways. This study seeks to understand how North Carolina local governments are responding to climate change with an emphasis on how they are communicating with residents and receiving resident input about these responses.

Climate change impacts

Some effects, among many, of a rise in global temperature include worsening droughts, extreme precipitation, rising sea levels, damage to coastal infrastructure, and loss of resources throughout different regions of the world. The Intergovernmental Panel on Climate Change (IPCC), the United Nations' group that shares regular reports on climate science and threats, states that climate change of 1.5 degrees Celsius or higher will likely harm human health, reduce access to food and water, and threaten economic growth (IPCC, 2021a; IPCC, 2018). Responding to climate change is urgent. At the current rate of greenhouse gas emissions, global warming will likely reach 1.5 degrees Celsius between 2030 and 2052 (IPCC, 2018). The earth's temperature has been increasing at double the rate between 1981 and 2020 when compared to increases between 1880 and 2020 (Lindsey & Dahlman, 2021). Heat waves, heavy precipitation, droughts, and tropical cyclones act as evidence of the human-caused rise in global temperature affecting the climate (IPCC, 2021b).

Like the rest of the world, North Carolina is facing a range of climate threats. Associated risks vary throughout the state. Some of these threats include sea level rise, more-intense storms like hurricanes, flooding, extreme heat, and harm to the fishing, tourism, and real estate industries (Devlin et al., 2014). Some local governments, especially coastal local governments, must consider historic properties' resilience to climate change (Wolff, 2021). Hurricanes and sea level rise are higher risks in the eastern part of the state, while landslides are particularly concerning in western North Carolina (State of North Carolina, 2020). Additionally, risks tend to be higher in rural areas. People in more-urban areas are likely to have a greater capacity for climate resilience than more-rural areas, particularly in the western part of the state (Sugg et al., 2021). In this study, resilience is "the ability to anticipate, prepare for, and respond to hazardous events, trends, or disturbances related to climate" (Center for Climate and Energy Solutions, 2019). Climate change also poses a risk to mental health (Kunkel, 2020; Wolff, 2021).

The effects of climate change will not be equal on all people. Injustices occur when climate change causes more-devastating effects on some people than others, especially when people who contribute least to the problem face the worst effects (IPCC, 2018). A 2021 EPA report says that racial minorities are most likely to live in areas with the worst projected impacts of 2 degrees Celsius rise in global temperature or a 50 cm rise in sea level globally (US EPA, 2021). Some reasons that non-white communities face worse effects from climate change, like health

problems related to worse air pollution, include a history of residential segregation and unequal access to health care (American Lung Association, 2020). Also, people in the United States who are low-income or do not have a high school diploma are about 25% more likely than people who are not low-income and who have a high school diploma to live in areas projected to have worse climate impacts (US EPA, 2021). Climate injustices are also present in North Carolina (Clifton & Kelly, 2020). One of these injustices is energy poverty. It occurs when households cannot afford to pay for healthy and comfortable temperatures. One way to help people experiencing energy poverty is weatherization programs that improve insulation or fix heating and cooling equipment (Harrison & Popke, 2011).

Despite the potentially devastating impacts of climate change, the IPCC describes sustainable development as a way to reduce this devastation because it can help with mitigating and adapting to climate change impacts while also reducing poverty and inequality (IPCC, 2018). The United States Sustainable Development Report 2021 said that most states are far from achieving the United Nations' Sustainable Development Goals due to inequalities across communities, such as racial minorities experiencing greater rates of homelessness. COVID-19 has created challenges for sustainable development, like stay-at-home orders reducing access to affordable housing. Environmental justice efforts can help states protect the environment and reduce injustices for marginalized groups, especially Black and Indigenous communities (SDSN, 2021).

North Carolina local government responses to climate change

There is a need to understand how North Carolina local governments are responding to climate change to reduce climate threats and resulting injustices.

Governor Roy Cooper's Executive Order 80 (2018) required the NC Department of Environmental Quality, along with other state agencies, to create a risk assessment and resilience plan for the state. Under the order, local governments play a key role in creating plans and implementing practices that respond to climate change (State of North Carolina, 2020). This plan is not the only source of recommendations for local government climate responses in the state. For example, the Coastal Hazards Center of Excellence has shared strategies for responding to climate impacts like sea level rise (Woodruff et al., 2013).

Local government employees may understand resilience in different ways. Local decision-makers tend to think of resilience as "bouncing back" rather than "bouncing forward." Unlike academics, local decision-makers often do not mention diversity, flexibility, or redundancy when describing climate resilience. There is a need to reduce this gap in understanding of climate resilience in order to help local decision-makers use climate resilience research and implement effective resilience policies (Meerow & Stults, 2016). Moreover, two natural disasters affecting North Carolina in 2018, Hurricane Florence and Hurricane Michael, showed that communities need access to basic services (like food, education, etc.) to help them quickly bounce back after disasters. This finding shows that local governments can conceptualize the idea of resilience as access to essential services (Logan & Guikema, 2020). Since such conceptualizations can vary across locations, there is room to study how North Carolina local government employees describe programs responding to climate change.

Local bureaucrats - unelected officials in local government - can shape responses to climate change, like sustainable development, because they have knowledge about issues affecting their communities and about relevant state and federal policies. They can make changes when politicians will not lead responses to climate change (Kelley, 2018). However, local governments can face several challenges when responding to climate change. State laws and policies can constrain them, and intrastate preemption - or “state legislation that limits local government action” - can reduce communities’ abilities to solve problems themselves (Amsler & Vieilledent, 2021, p. 159).

Researchers have proposed frameworks for analyzing local government responses to climate change, especially at the planning level. Meerow & Woodruff (2019) asserted that seven principles are necessary for communities to plan in the face of climate threats. Those principles include the following: (1) setting clear goals that are specific and measurable; (2) having data about current and future local climate impacts, such as greenhouse gas emissions inventories and vulnerability assessments; (3) using a variety of strategies, like changing processes and policies as well as determining co-benefits that increase support for climate policies; (4) engaging the public to help all community groups have a voice in developing the plan; (5) collaborating with different actors and sectors, including other local government departments, other government levels, and private businesses; (6) having processes for implementing initiatives, such as by having clear timelines and responsibilities for different actors; and (7) recognizing and planning for uncertainty, such as uncertainty around climate impacts and public responses to climate initiatives. Communities should use data, projections, and models to develop strategies. These principles can help communities mitigate their own contributions to climate change and become more resilient to climate impacts (Meerow & Woodruff, 2019).

Research shows that the number of climate disasters people face does not tend to affect their environmental policy preferences; factors like race and spatial dimensions (being in rural or urban areas) are more impactful in how people think about the environment. Local governments must listen to communities with greatest vulnerabilities and recognize that people of different races, ethnicities, and income levels perceive the importance of local climate action differently (Danis et al., 2019).

Effective climate change communication

Given the urgency of responding to climate change, it is necessary to study how local governments can best communicate about their responses to climate change with residents so that they understand what their municipalities or counties are doing and how it affects them as well as how they may get involved.

The IPCC commissioned Climate Outreach to develop an evidence-based guide for IPCC authors to effectively communicate findings. The guide details six key recommendations for effective climate communication when engaging with the public: (1) be a confident communicator to come across as authentic and trustworthy; (2) talk about the real world, not abstract ideas, in order to better relate to audiences; (3) connect with what matters to audiences, such as by describing local climate impacts or ways climate change connects with their values; (4) tell a human story, which audiences may find more interesting than data; (5) lead with what you know

to help audiences understand aspects of climate science that are certain rather than aspects of climate science that are uncertain; and (6) use the most effective visual communication, like images and charts, to help audiences understand climate change. Using these strategies can help scientists convey information about climate change, a topic that is emotional and politically polarizing for many people (Corner et al., 2018).

In North Carolina, opinions about climate change vary across counties. In 2020, counties ranged from having 57-80% of adults thinking that global warming is happening. Additionally, counties ranged from having 44-62% of adults thinking local officials should do more to address climate change (Marlon et al., 2020).

As climate change is a politically polarizing topic, some people may view communication about climate change as an attack on their identities (Hayhoe, 2021). Therefore, it is important to study how to communicate about climate threats and responses in ways that make people receptive to this information. Facts are often not effective with people who do not think climate change is happening because the facts do not fit their frames, or ways they see the world (Hayhoe, 2021). A study found that values, ideologies, worldviews, and political orientation are more likely than education or knowledge to affect people's opinions on climate change (Hornsey et al., 2016). Facts can be effective when addressing misconceptions and misunderstandings but are typically not enough to motivate people to learn more about problems and how they play a role in solutions. Instead of relying on facts, people can discuss aspects of their identities and their hobbies that may relate to climate change and show why they have an interest in solving the problem. They could show how climate change will negatively affect the things they value; for example, communicators can explain that climate change could affect foods like chocolate and coffee that people like (Hayhoe, 2021). Additionally, communicators should rely on messages inducing fear and guilt sparingly as they could lead to inaction if people think that the situation is hopeless and that they cannot do anything to reduce those risks (Hayhoe, 2021; Morris et al., 2020; Sharot, 2017).

Multiple aspects of climate change make it seem like a distant threat to some people. It is abstract since people cannot see the greenhouse gas emissions causing the problem. Many people think of climate change as a threat that impacts people in other areas rather than their own and future generations rather than people today. Also, people may think that climate change is only a concern to a niche group of people rather than something that impacts most places and people (Hayhoe, 2021). These misconceptions leave room for studying how communicators, such as local government sustainability employees, may communicate about climate change to help people understand why it is a problem that likely impacts them, similar to the IPCC's third science communication recommendation (Corner et al., 2018).

Local governments do not necessarily have to change attitudes around climate change to encourage involvement in climate resilience. A study in New Hanover, North Carolina, shows that homeowners' knowledge and attitudes about climate change do not significantly affect how much they have taken steps to reduce or plan to reduce their homes' climate vulnerability. Instead of using public awareness campaigns to convince people to believe in human-caused climate change, those wanting to improve resilience could emphasize that people should reduce their homes' vulnerability to increase safety and prevent future costs (Javelin et al., 2019).

Social media plays a role in the ways local governments communicate with residents. A study found that social media helped governments perform their duty of communicating about Florence recovery efforts and helped governments gauge public opinion to a limited extent. The research recognized staff limitations can make it difficult to respond to all people but recommended that governments use social media tools that complement each other. More relevant recommendations include that governments use social media to keep track of information that resonates most with the public and coordinate communication with other levels of government (Handa, 2019).

Limited research has been conducted on how North Carolina local governments respond to and communicate climate change, so there is a need to further study how local governments across the state respond to climate change and the role of communication with residents in those responses.

Public engagement at the local government level

While it is important to study how local governments are telling residents about climate responses, it is also necessary to understand how local governments get input from their residents so they can appropriately address needs and concerns. An American Planning Association article says local governments should use certain strategies to effectively engage the public. These strategies are to build relationships with key community leaders who can encourage participation, meet residents at their current understanding by providing information for different levels of knowledge, know their target audience and connect to what matters to them, make public engagement fun, find and reduce barriers that some people may face with public participation, and maintain ongoing relationships with residents (Spivak, 2019).

Further literature in public participation shares best practices for creating democratic local community-based adaptation to climate change: provide clear and credible public information, invite the public to participate in decision-making processes, and offer financial support and incentives for participation as needed (Howes, 2018).

Local governments have to find ways to continue to function and engage participants even during hard times, from climate change to the COVID-19 pandemic to economic recessions. A study found that organizational complexity is a factor that could facilitate residents' participation in local government initiatives during the 2007 economic crisis in the United States (Jun & Bryer, 2016).

An example of lessons learned from public participation around environmental and land use issues in the United States comes from frontline communities at freight gateways in California and Michigan. A study found that groups that have been historically marginalized in planning have faced greater environmental threats and burdens to public participation. Some strategies for improved public participation include partnering with community organizations, making public meetings accessible to environmental justice stakeholders, and helping communities understand local governments' role in responses to environmental and health issues (Sampson et al., 2014).

Limited research has been conducted specifically on public participation on environmental issues in North Carolina.

Given the significant threats of climate change, particularly in North Carolina, local governments need to mitigate their contributions to climate change and take steps to increase their resilience to climate impacts. Key aspects of local governments responding to climate change include communicating about these responses with residents as well as seeking and responding to resident input about climate initiatives. To inform future local government responses to climate change, it is helpful to study how employees involved in climate responses in North Carolina local governments describe ways those local governments communicate about climate change, receive resident input, and implement successful initiatives with public engagement.

Research Questions

This study investigated how a subset of North Carolina local governments communicate with and receive input from residents as they respond to climate change. The following questions guided this research:

1. How do North Carolina local government employees describe the ways they communicate with residents about climate initiatives?
2. To what extent do North Carolina local government employees seek and respond to resident input about climate initiatives?
3. How do North Carolina local government employees describe successful climate initiatives with public engagement?

Methods

This qualitative study was conducted in North Carolina. Study protocols were reviewed and approved by the UNC Institutional Review Board (#21-1011), and the study was determined to be exempt from further review in June 2021.

Potential participants were identified from the Southeast Sustainability Directors Network (SSDN), local government websites, and snowball sampling (SSDN, n.d.). The goal was to interview sustainability employees from municipalities or counties of different sizes and in different parts of the state. A total of 28 sustainability employees were emailed an invitation to participate in the study as this was the total number of sustainability employees identified from SSDN, local government websites, and snowball sampling; not every North Carolina local government has an employee focused on sustainability. These potential participants were each emailed a recruitment letter inviting them to join the research study. The letter explained the study purpose and logistics and indicated that no compensation would be offered for participation. Individuals were asked to respond to the email if they wanted to learn more about the study.

Individuals who responded received additional information about the study and were sent a link to a Qualtrics survey with screening questions and a consent form. The screening questions addressed the following inclusion criteria: (a) active employment in a North Carolina local government, (b) working in a position focused on sustainability, climate change, or resiliency, and (c) English speaking ability. Individuals also were asked about their willingness to be audio/video recorded during the interview, though recording was not required for participation.

Twelve people consented to participate in the study. All were professionals managing sustainability efforts and local government responses to climate change in cities, towns, or

counties in North Carolina. Most were based in different counties except for two participants: one worked for a populous county, and another worked in a town within that county. Two participants were from the coastal plain region of the state, three were from the mountain region, and seven were from the central Piedmont region. Participants worked in municipalities and counties of various sizes (see Table 1).

Table 1: Participating local governments by population

Population	Number of Local Governments
0 - 100,000	3
100,001 - 200,000	4
200,001 +	5

Note: This study will refer to local governments with populations of 0 - 100,000 as small, local governments with populations of 100,001 - 200,000 as medium, and local governments with populations of more than 200,000 as large. Data comes from the 2020 United States Census.

In general, the racial and ethnic composition of residents in the participating local governments was dissimilar to the racial composition of residents of the state of North Carolina as a whole. According to the 2020 United States Census, North Carolina has an average white population of 70.6%, Black population of 22.6%, Asian population of 3.2%, and Latinx population of 9.8%. Four of the 12 municipalities/counties in the study are at least 80% white. Three of the municipalities/counties have an average white population of 60-80%, which is closer to the North Carolina average. Five municipalities/counties have a population that is between 40-60% white. Five municipalities/counties have a Black population of more than 25%, and seven municipalities/counties have a Black population below 20%. Six municipalities/counties have an Asian population of more than 3.2%, and the other six municipalities/counties have an Asian population below 3.2%. Also, seven municipalities/counties have a Latinx population of at least 9.8%, and five of the municipalities/counties have a Latinx population of less than 9.8%.

The interviews were conducted on Zoom between July and October 2021, and each lasted between 45 and 60 minutes. The interviews began with participants confirming their agreement to participate in the study and to be recorded if they had agreed to do so. Interviews were semi-structured and based on an interview guide. At the outset, participants were asked about their job titles, educational background, and previous roles that led to their current role. The interviewer then listed programs addressing sustainability and/or climate change that they had identified through research prior to the interview. Participants were asked to confirm these programs and describe any other major programs responding to climate change. Next, participants were asked to identify a particular climate initiative that they deemed successful and that involved public engagement. The participants were asked to explain how the initiative was developed along with any barriers they faced. Then, participants were asked how residents of their community have demonstrated their opinions about programs responding to climate change. Follow-up questions focused on how participants ensured they heard from a cross section of all residents, any

misconceptions that had been expressed to them or in public settings about climate programs, and how any focusing events may have influenced public opinion. Finally, participants were asked how they shared information about climate initiatives with residents. Follow-up questions addressed how participants framed messages about climate change, how they used social media to communicate about climate initiatives, and how they explained ways that residents could support climate resilience, if they did so.

After the interview, participants were asked to complete an optional demographics survey that addressed gender identity, birth year, race/ethnicity, highest degree or level of education, and annual income.

Interviews were recorded on Zoom and were transcribed verbatim using the Zoom transcription feature. Transcripts were compared to the recorded interviews at least twice each and edited manually, as needed. The 12 transcripts totaled 160 single-spaced pages. Transcripts were uploaded to the ATLAS.ti 9 software and coded to answer the research questions. About 25% of the data was coded by two researchers, and they jointly developed a codebook. The remaining 75% of the data was coded by the primary researcher, and individual transcripts and codes were reviewed by the second researcher. Where coders disagreed or applied different codes, differences were resolved through conversation. There were nine code families - job description, municipality programs, resident input, collaboration, barriers, local government messaging, capacity, equity efforts, and goals, as well as one other code - unique. There were 23 subcodes - education, work experience, language used for success, resilience, sustainability, organization type, resident input channels, misconceptions, climate impacts, individual action, internal collaboration, external collaboration, COVID-19, money, best practices/strategies, local government messaging channels, trust, equity needs, accessibility efforts, staff capacity, other capacity, existing goals, and aspirations.

Participant demographics

Six of 12 participants filled out the optional demographics survey. Four respondents were male, and two respondents were female. All respondents were between ages 30 and 60. The salary range was \$30,000 to 109,999. All six respondents who provided demographic information identified as white. Regarding the racial/ethnic demographics of communities where they worked, four respondents worked for municipalities/counties with percentages of white residents above 80%. One respondent worked for a municipality/county with a percentage of white residents between 60-80% (near the state average of white residents), and one respondent worked for a municipality/county with a percentage of white residents below 60%. Five of these six respondents worked in municipalities/counties with Black populations of less than 15%, and one worked for a municipality/county with over 30% Black residents. Four of the respondents worked for municipalities/counties with less than 3% Asian residents, and two of the respondents worked for municipalities/counties with more than 4% Asian residents. One of the six respondents worked for a municipality/county with a Latinx population above the state average of 9.8%. Comparable data for North Carolina local government employees is not available.

In addition to the survey responses, interviews revealed that three participants had bachelor's degrees and nine participants had graduate or professional degrees.

Findings

Research Question #1 on Communication:

Participants described a variety of communications channels and strategies.

Communications channels

Participants reported sharing information about climate initiatives with residents through varied channels, with frequencies presented in Table 2.

Table 2: Channels for communication about climate initiatives

Channel	Number of Participants Who Mentioned This Channel
Local government website	9 (75%)
Facebook	6 (50%)
Public meetings	5 (42%)
Instagram	3 (25%)
Twitter	3 (25%)
Newspaper	3 (25%)
Sustainability listserv	2 (17%)

While a local government website was a common channel, one participant mentioned their local government's website did not have much information because it was new. Another participant who mentioned a website said they do not keep it updated because they are the only sustainability staff member for the local government.

Social media was used to communicate with residents, to varying extents

Participants were asked about the role of social media in communicating about climate initiatives. Six participants (50%) described it as a significant aspect of communications. For example, one of these participants said, "that's how we get the word out for literally everything." This participant worked for the local government - a county - with the highest population in this study. Also, this participant reported that social media was one of the only ways they were able to communicate with residents during the pandemic because people were not attending in-person events. In contrast, another participant identified a barrier to using social media, saying that one of their citizen committees "has their own Facebook account, but...because people are a little afraid of going in saying the wrong thing or going...counter to the social media policy, and

because they're all volunteers, it's rarely used.” This participant worked for a medium-sized county.

Other participants reported using social media to find community members for their sustainability task force, to educate residents about goals like climate neutrality, to share announcements about events and ways residents can get involved in sustainability initiatives, and to communicate with people in underserved neighborhoods about the opportunity for weatherization services.

Two participants said that they have not been involved with social media. One of these two said that the local government had some social media pages but they were not involved with those communications. Another of these two said that their local government had a communications team that shared information about many topics on social media but that they have not used this channel. Yet another participant, who worked for a small municipality, noted that social media became prominent in the local government only after a communications specialist was hired. They said social media was not used effectively prior to this new hire.

Strategies

Participants reported using a variety of strategies when asked how they shared information about climate initiatives with residents.

Framing

Seven participants (58%) described using varied framing to appeal to different audiences.

Six of seven participants (86%) reported using the frame of saving money as a way to describe programs. One of these participants justified this frame, saying “for the lay person I really think that's the best path to take.” They also shared their opinion that “scaring people” by describing negative impacts of climate change would not motivate them, especially since their area does not experience as high temperatures as some others in the state. This participant worked for a small municipality in the western part of the state. Another participant, who worked for a county in the western part of the state, said that they try to help “conservative folks” be receptive to climate initiatives by telling them that these initiatives save money for the local government. Finally, another participant said that they have not engaged with residents but mentioned that if they hypothetically talked with community members, they would explain that climate initiatives can reduce energy costs; for example, buying an electric car could cost more money up front but save money in the long run. This participant worked for a large county.

Two participants mentioned connections between human health and climate initiatives. One mentioned “human health” as an example of trying to “come about it from a different angle” to increase residents’ receptiveness to climate initiatives. This participant worked for a medium-sized county in the western part of the state. Another said that they emphasize the connections between climate and health when interacting with residents. They explained, “If we connect the effects of climate change to health and understand the health benefits from doing different,

taking different alternative means for activities, that resonates with people.” This participant worked for a large county.

Making climate responses personal

Participants said they try to make climate responses personal in several ways. Two participants explained that they choose which climate initiatives to share with public audiences based on whether the initiatives impact those audiences. One of these two participants said that they alert people when they are expected to see environmental projects, like a stream channel restoration project. The other of these two participants said that they choose to share bigger initiatives on social media when those initiatives will impact the public. Moreover, another participant reported a focus on explaining what people can do about climate change at home, while another explained that they center programs on residents and why programs matter to them. Another participant said that they try to talk about how weatherization programs will improve people’s comfort in their homes. A different participant, who worked for a large county, shared that to make residents receptive to programs, they try to be as positive as they can and “root the messaging in action-oriented things.” They explained that giving people tools and strategies and being a “lightning rod for that positive energy” could encourage residents to want to “make a difference.” One participant highlighted the importance of catering to their audience by giving an example of how they would frame a solar project in different ways for two different audiences. They said, “If I’m talking to the Sierra Club, I’m talking about saving the world, you know, like that’s easy because that’s what they want to hear.” They said that if they are talking with a more-conservative group like a rotary club, they would focus on saving money, efficiency, and energy independence. This participant worked for a county in the western part of the state.

Clear communication

Participants also described the ways they use clear communication. One participant said that they try to be as transparent as possible as well as simple when describing initiatives. Another participant said they are clear and concise and tailor messages to audiences. A participant mentioned the need to use plain language and visuals to help people understand sustainability programs like climate neutrality for government operations. One participant said they provide different levels of technical information for different audiences. This participant also said they try to make communications engaging, hopeful, positive, and informative. Another participant said they had a strategy of sharing tidbits of information about the environment in the community which can be shared on social media.

Strategic timing

Additionally, participants described the timing of communication about climate initiatives with residents. One participant said that they share updates when the local government hits milestones with programs. A participant shared that they collaborate with community organizations to push out messages when they can since they know their social media posts do not reach everyone. Moreover, a participant said that they communicate with weekly, quarterly, and annual reports. This participant, who worked for a medium-sized municipality, explained, “we like to keep people apprised of what we’re going to do, what we’re doing, and what we did.”

Strategy of partnering with community leaders to overcome mistrust

Two participants described mistrust as a challenge for reaching communities in their municipalities/counties, particularly about weatherization programs. One participant explained they thought that residents felt the government was making promises on which they could not deliver and that weatherization would not truly be free. The participant said that they identified community leaders who could help publicize their programs. They met with community associations and enlisted leaders to help with outreach. This participant explained how they viewed the involvement of community leaders as key, saying, “These are people that...they’ve lived all their lives in the communities, they’re well-known, and they’re trusted by residents, so when they, you know, talk to people and give their endorsements, say this is something you should sign up for, that carries a lot of weight.” This participant worked for a large municipality in the center region of the state. A second participant described trust as a barrier for communicating about a weatherization program with residents in communities of color and low-income communities. They described a “well-founded, but very serious, distrust of government right in the first place” and explained that government historically has “been a huge part of the problem,” although they did not define the exact problem that they thought led to this distrust. This participant said they overcame this problem by partnering with community leaders. The municipality also identified a trusted community leader and reported that “establishing a relationship with her was critical for us and getting any support at all.” This participant worked for a county in the western part of the state.

Responding to limitations and requirements of state governments

Two participants shared how state government policies affect the ways they communicate about climate initiatives. One participant explained how they can use state requirements to their advantage to communicate about climate initiatives, whereas another participant explained how they have to overcome having limited power as a local government. The first of these participants said they like blaming state statutes: “I love when I can put the blame on state. That’s why I would love to see more federal and state initiatives so that you can take the the local politics kind of out of it.” The other participant explained that state government “hinders” what local municipalities can do since the state told a local government that they couldn’t do a plastic bag ban. They explained that “all we can do right now is show people the magnitude of the problem and then hope voluntarily that they’ll behave differently.” Both of these participants worked in municipalities/counties in the western part of the state.

Aligning actions with words

One participant from a small western municipality said that the municipality shows what the town is doing to be sustainable, explaining that “the town needs to walk its talk” and that “we need to do those actions that we want to see other people do.” Plus, another participant said that the municipality does not take actions just for show, like how they would only put solar panels in places where they can be used instead of wasting money on putting them in spots only for residents to see.

Constraints on communications

Participants identified staff capacity and COVID-19 as limiting communication with residents about responses to climate change. Four participants (33%) noted that they would like to do more to communicate with residents about initiatives responding to climate change, but they are limited as the only person or a new person focused on sustainability in the municipality or county. Three of these four participants (75%) mentioned that they would like to update the website but have not yet had time; two of these three participants worked in counties that had some of the highest populations among all municipalities/counties included in the study. Two participants described ways that the COVID-19 pandemic limited their local governments' abilities to communicate with residents about climate initiatives. One participant, from one of the larger municipalities/counties, explained that with online stakeholder engagement meetings, it is hard to know whether they are "reaching as broad an audience and getting as deep a level of engagement as we need to." Additionally, a participant said that COVID-19 information has dominated the county's social media, which has trumped communications about climate change. This participant worked for a large county. An additional constraint can be a marketing budget as one participant, who worked for a medium-sized western county, shared that they have a campaign with a theme each month and that they are lucky to have a marketing budget to do that.

Research Question #2 on Resident Input:

Channels for receiving resident input

Participants shared several ways that they had seen residents demonstrate their opinions about climate change and responses to the issue locally. The most common communications channel was public meetings.

Table 3: Channels for receiving resident input about climate initiatives

Channel	Number of Participants Who Mentioned This Channel
Public meetings	12 (100%)
Committees/task forces	10 (83%)
Social media comments	5 (42%)
Surveys	4 (33%)
Email	3 (25%)

All 12 participants described receiving resident input at public meetings (in-person or online). One participant reported that all meetings had been virtual since this participant started working for the municipality and noted that virtual meetings got limited public engagement. Another said that, despite opportunities for residents to provide input on a climate plan at public meetings, they did not have any conversations with residents about climate initiatives in their municipality.

They noted that as the only full-time sustainability employee, they did not have the capacity to speak with residents.

Ten participants (83%) mentioned having committees or task forces made up of residents that are involved in planning or leading climate initiatives. These committees were organized around topics including clean energy, infrastructure, solid waste, and sustainability. One participant reported using their clean energy task force to help ensure they are representing all residents. They explained that the mayor and city council selected members based on experience level and representation to get a diverse group.

Other mechanisms included social media, surveys, and email. Five participants (42%) mentioned social media as a way they received resident input. One participant, who worked for a medium-sized municipality, said that social media is their primary method of receiving citizen feedback, including feedback about opportunities they would like the municipality to pursue regarding climate change and greenhouse gas emissions. Four participants (33%) reported that their municipalities/counties used or planned to use surveys for receiving resident input. One indicated that their municipality surveyed every other year about a variety of topics, including climate change. They said it is a statistically valid phone survey sent to a random sample of residents. Another participant shared a resilience and hazard mitigation planning process that included a survey asking about climate and resilience. Yet another participant shared that they plan to ask sustainability questions in an upcoming community survey and that they had administered a randomized survey but it was not focused on sustainability. One of the three participants who mentioned email explained that community groups like the Sierra Club provide input by sending email messages to the mayor.

Receiving input about environmental justice initiatives

One participant, from a large county, described using a different process for receiving input about environmental justice initiatives versus for their sustainability plan. For the latter, they received public input on a more-robust proposed plan and used that input to revise the plan. In contrast, for environmental justice work, they are bringing a skeleton plan (and relevant data) to communities for feedback, including what they got wrong or what may be missing. This participant added that they think the county will “rely heavily on community organizations, churches and just advocates for the environment throughout the county that are specific to communities of color.” They explained that they are doing this environmental justice work because it is part of their job description. This participant also mentioned using paper mailers for people who do not have Internet or cannot attend in-person meetings. Residents can share their phone numbers to receive direct calls to discuss initiatives. The participant added that they hope to have a landing page for giving feedback about environmental justice so people can provide feedback even if they cannot attend a real-time session.

COVID-19 pandemic as barrier to receiving input

COVID-19 complicated receiving input through the traditional approaches, meetings and public comment periods. One participant, who worked for a small municipality, said that the municipality did not have in-person public meetings during the pandemic, even when

surrounding municipalities/counties were starting to have in-person meetings. This participant said they received “very little interaction from the public at those meetings.” Another participant who worked for a small municipality said, “Having a pandemic really limited our ability to physically go out in the community and meet with different groups.” Additionally, one participant said they like to show up to community organization meetings but that it is harder to know if people are paying attention if their cameras are not on for online meetings.

In response, municipalities/counties adapted with virtual meetings and social media. One participant explained pros and cons, saying: “it is a lot more effective to be able to meet and interact with stakeholders in person, and so we've tried to deal with that challenge [of having to do everything remotely] by making our meetings accessible for anyone who wants to watch them but not necessarily participate. We simultaneously live streamed the stakeholder engagement meetings on Facebook. So someone who may not have the technical know-how or the equipment to be able to participate in the meeting through Zoom can just watch along and be aware of what's going on at least.” This participant worked for a large municipality in the center region of the state.

Internal goals affecting public engagement

Four participants (33%) explained that emissions reductions goals were internal and focused on the city. Three of these four participants (75%) explained how internal goals led to a lack of public engagement. For example, one of these participants said, “Our office has historically been more internally facing rather than external, so we haven't had a lot of community engagement opportunities or projects or programs that would involve a lot of community input at this point.” This participant worked for a large municipality in the center region of the state. The other participant, who worked for another large central municipality, said they do not currently have the capacity for engagement and that the focus is internal at this point. Additionally, a different participant said that many grants are internally focused and do not prioritize public engagement, although the local government has other initiatives involving public engagement. While yet another participant said, “I focus much more on the internal operational stuff because that's what I have more direct control over frankly,” they still noted that public engagement played a big role in climate initiatives. This participant worked for a county in the western part of the state.

Responding to resident input

As they described ways they receive resident input, participants also described how they have responded to residents about climate initiatives. One participant, who described residents in their community demonstrating their opinions on climate change by saying “they show up,” continued to say that residents making their voices heard does influence the way elected officials in that local government make decisions. This participant, who worked for a western county, described resident input as critical for implementing a clean energy project, saying, “I will tell you absolutely we could *not* have done it without community engagement.” They explained how a key stakeholder backed out of the initiative, which resulted in hundreds of people calling, sending emails, and showing up at public meetings. Within 48 hours, the key stakeholder apologized and supported the initiative again. As a result, the participant said the local government implemented the clean energy project and it “couldn't have ended better.”

In a coastal municipality, residents voiced through local organizations like a chapter of the Sierra Club that they wanted a sustainability committee to lead progress toward clean energy goals. The participant from this municipality explained, “The Mayor and City Council certainly got behind that, and from that were able to put together the task force to kind of get the ball rolling.”

Another participant said that in their municipality, many comments on a plan to reduce the county’s emissions were about why a local city was not getting to net zero emissions sooner. The participant said that was “useful feedback,” but because the city and county control different processes, the feedback did not address what the county controls. The participant responded by taking “taking that feedback into account...we need to ground these individuals by saying, ‘listen, like this is what we know, this is what we don’t know, and this is what the county can control.’” This participant worked for a large county.

Additionally, a participant described community groups as a “double-edged sword” because they came through when the participant needed them to make calls to support a climate initiative but also called on the participant to do more when they needed to focus on other aspects of their job. The participant explained, “they make me feel like no matter what I’m doing it’s not good enough.” This participant, who worked for a western county, claimed to understand that residents are passionate because “climate change is the biggest crisis that we face as a species.”

Suggesting that residents make personal changes, especially around transportation, when residents ask how they can support climate resilience

In response to a question about how they would respond to residents who asked how they could support climate resilience, four participants (33%) directly mentioned that residents should consider transportation changes, such as buying electric cars and driving less. One of these participants said that they wanted to create a communications piece with specific actions that individuals could take based on how much money and time they had; for example, if they have enough money, they could buy an electric car. Three participants (25%) mentioned waste reduction, with one who worked for a western county saying, “look at what you do, look at where you waste, right, look at what products you buy and the things that you use.” Another participant also shared the strategy that they recommend residents read the book *Drawdown* by Paul Hawken since it “systemically” explains what people can do to reduce greenhouse emissions. “That helps to put things in perspective for folks and help them understand, you know, what changes they can make will have the greatest impact,” explained this participant who worked for a municipality in the center region of the state. One participant, who worked for a coastal municipality, focused on how businesses can contribute to climate initiatives, saying, “We also want to help businesses understand kind of their role in resilience and how, you know, they can take steps to ensure better continuity in their own businesses in the face of natural disasters especially.”

Misconceptions about climate change

In response to a question asking what misconceptions residents expressed to them or in public settings, nine participants (75%) shared a variety of responses about misconceptions they had

heard. One participant said they perceived misconceptions related to the impact and feasibility of climate initiatives, like electric vehicles. They explained, “it's more from a functional and a practical point of view than it is from a, you know, esoteric [disbelief in] climate change.” This participant worked for a municipality in the western part of the state, and this municipality was one of the smaller municipalities in the study. A different participant said that they hear misconceptions about climate impacts rather than whether climate change itself is a problem. This participant, who worked for a medium-sized municipality in the central Piedmont region of the state, said that they think some people think the municipality will catch fire and run out of water like the western United States.

Another participant said a misconception was about the most-significant way their small, central municipality was contributing to climate change. The participant explained that some residents thought waste reduction should be a priority but that emissions data showed that more emissions were coming from buildings, fleet vehicles, street lights, and the government staff commuting. The participant explained, “people might focus on something that they see in the day to day, but it actually...may not have a large impact and a significant impact.” The participant said this disconnect showed that education was needed about climate change and how people contribute to it.

Next, a participant who worked for a large central county said they thought that residents were unsure about what a local government can do and were unaware of limitations. They cited the example of a local attempt to ban plastic bags. This participant said another possible misconception was “about prioritizing” because residents may not recognize that structural support and funding must be considered for projects like solar panels on community facilities.

Three participants responded that they had heard few to no misconceptions. One of these participants described “an overemphasis of that one type of technology, as this, the solution that's going to get us to our goals.” They explained that some people thought “we can just kind of solar panel our way to sustainability.” This participant worked for a large central municipality. Another of these participants noted that although they did not engage with the community as part of their job, they had not heard misconceptions from city staff or elected officials. They said, “I think the city leadership and staff understand that climate change is real and that it's impacting our city and communities.” This participant also worked for a large central municipality.

Two participants noted the misconception that climate change is not happening, with one who worked for a large county saying they hear a “genre of complaints” that climate change is not happening and, for this reason, that the local government should not spend money on it. The other participant, who worked for a medium-sized county, said that residents' misconception is that “climate change isn't here, happening now, impacting people's lives, contributing to economic loss, loss of life, loss of health.” This participant added, “I think there's another misconception that says that these are problems that will happen in the future and that aren't happening right now, because they're a little bit more hard to see.” This participant noted that the perception that climate change was not a priority was somewhat accurate because the county has more immediate, day-to-day services it must fulfill.

Research Question #3 on Successful Climate Initiatives with Public Engagement:

Local government programs: language used to describe climate initiatives identified as successful

Participants were each asked to describe a successful climate initiative that involved public engagement. They described success in several ways, noting some common points that led to success. Six participants (50%) noted finances as a factor that led to success. Finances could include a financial investment, a tax, funding for programs, or aspects of an initiative being free of cost. Five participants (42%) noted metrics - whether a clean energy target is the initiative itself or about progress their local governments have made toward clean energy goals. Three participants (25%) specifically identified partnerships, like with a university and nonprofit organization, as part of the initiatives. Elected officials were mentioned in differing ways. In one case, a participant noted support from elected officials as important to their success, but another described using a pilot program to show elected officials that the program could be successful.

The following examples highlight ways some participants described their local governments' successful climate initiatives with public engagement.

Standout local government: recent, biggest, internal, metrics, taking advantage of funding, national interest

One participant identified a successful initiative with public engagement to be a resolution for the municipality to run on 100% renewable energy - where feasible - by a particular date with an interim goal. They described it as “probably the most recent and the biggest project we’ve done” but said that work had been mostly internal. This participant later identified electric vehicle chargers (and noted the number) as a successful program and said they are looking to take advantage of federal funding for electric vehicles that has become available. Moreover, this participant described a successful clean energy project and thought that contributing factors to its success were national interest in solar and getting funding for the department. They said that “the tangible change has come from that solar funding.” This participant worked for a large municipality in the center part of the state.

Standout local government: free, accessible, helps bottom line, role in climate change, temporary, inspiration, metrics

Another participant explained that their medium-sized municipality’s food waste drop-off program was “a free, accessible program for people to compost and it’s not just a backyard compost system ... that really does help someone reduce their waste.” Plus, the sustainability employee said that reducing waste in the landfill helps the municipality’s bottom line and that they “do think that recycling and waste reduction and composting does play an important role in climate change.” They identified a pilot as successful because it is temporary but can provide numbers, or metrics, that could lead to it being a permanent program. They said that it inspired a nearby city to start a similar pilot.

Standout local government: grassroots effort, goal, plan, metrics, funding

Next, a participant described its municipality's successful program, the strategic energy plan, as a "grassroots effort." They said that it "was initiated by ... a kind of a persistent effort by a group of local citizens to get ... the [municipality] to adopt a goal for achieving 100% renewable energy." Additionally, the participant said that the chair working on the plan identified "an EPA document that lays out a very clear process for development of that very type of plan, and so we've been following that process that has a series of 10 very well described steps establishing a team, identifying the goals, and assembling stakeholders and engaging with them, or the process and then becoming more specific and developing strategies and actions and financing and funding mechanisms and a means for evaluating implementation and success of the plan." Also, they noted the number of electric buses the municipality has added to its fleet. This participant worked for a large municipality in the center region of the state.

Standout local government: partnership, comprehensive website, training, clarifying language

An additional participant identified a solar program as a successful initiative. They said that the municipality partnered with a state department to help make it easier for residents to install solar and shared a website with comprehensive information about solar. They also trained inspectors to inspect solar at residences and wrote clarifying language so there would be no question about it being allowed at residences. This participant worked for a medium-sized municipality in the center region of the state.

Standout local government: focus on social justice and racial equity, unlike other municipalities or counties

Next, a participant said that a successful initiative was a climate action tax and noted that it had a focus on social justice and racial equity. They also noted that the county is one of the only municipalities/counties (at least in the state) with such a climate action tax. They explained a downside, however: "this is already a relatively high tax area in comparison to our neighbors and property is already really ... expensive and exclusive in some ways, because of its expense. And so the climate action tax does add to how much it costs to own property in M4 every year." This participant worked for a medium-sized county in the center region of the state.

Participants noted a few other points when describing the successful climate initiatives with public engagement:

Serving as an example

One participant, who worked for a coastal municipality, noted that they want their municipality's resilience work to be a framework for other communities in the southeast. Another participant, who worked for a municipality in the center region of the state, thought that their successful weatherization efforts could be a case study for other communities.

Community support

A participant said that the county has heard from residents who want aggressive climate action when describing their climate action tax. A different participant, who worked for a county in the western part of the state, said that residents push for more and that they prefer this problem since other sustainability employees do not have the leverage, authority, or funding to get things done, implying that they do have leverage, authority, and funding for implementing programs.

Piloting before implementing

One participant shared that pilot programs are a great way for their municipality to get data that can lead to having permanent environmental programs. For example, the food waste drop-off pilot program helped the municipality get data about how much waste it was diverting, which helped it grow the program. They said, “I think pilots are great because ... they're temporary with the hopes of being successful and then making them an actual program. And then that also gave us really great data ... numbers speak.” This participant worked for a municipality in the western part of the state.

State requirements as helpful for climate responses

Two participants noted how state requirements could improve the local governments’ resilience efforts. One of these participants said, “if the state were to require a section or a chapter or dedicated research to climate change threats, specifically, then that is how we would be able to improve upon these hazard mitigation plans.” This participant, who worked for a large municipality, said that their emergency management department, from their view, is just trying to follow state requirements for hazard mitigation planning. They explained that as a result, more state requirements would be an opportunity for them to improve their plans. Also, as described in findings for the second research question, a participant said they like to blame state statutes when explaining why the municipality must take certain actions responding to climate change. This strategy of blaming state statutes was a way the participant described their communication for a waste reduction initiative that they identified as successful.

Other language used for success

Other participants described successful initiatives with public engagement in the following ways: creating short-term and long-term goals to reach 2030 and 2050 emissions reductions goals; having a program with weatherization and green infrastructure for homes that has the potential for growth and reaching more homeowners; having community engagement for getting other actors to support a renewable energy initiative; partnering with a nearby university to get recommendations for setting goals to mitigate climate change; engaging with advisory boards to collect data that helps with setting climate goals; having an affluent and educated population as well as elected officials who support sustainability initiatives; having a small size that makes the municipality “something you can wrap your arms around”; partnering with a nonprofit on a “simple” project; getting community feedback through surveys; and educating people about resilience initiatives to get community support.

Barriers to success

After participants identified successful climate initiatives with public engagement, they were asked to describe barriers that they or their local government faced with implementing these initiatives.

COVID-19

Nine participants (75%) described negative impacts of COVID-19 on initiatives with public engagement. One of these participants, who worked for a coastal municipality, described their clean energy task force as a successful initiative with public engagement; they described “pushing through” the COVID-19 pandemic as rewarding but also noted the pandemic as their main barrier to success. Some of these participants described challenges like COVID-19 social restrictions delaying an infrastructure program, putting projects on hold, making electric cars have limited availability, and making it difficult to effectively reach and hear from residents.

However, one sustainability employee, not included in the nine above, said that helping with the COVID-19 vaccination effort helped them make connections with community members and that they plan to use those connections to inform their climate action plan. They said that this work with the vaccination effort “enabled me to create real connections and relationships, I feel like with some of the more marginalized communities across [the county] ... now I have a working relationship with them and ... it's those groups of contacts that I was able to send information about the grant program and I plan to work with those connections ... to try to help inform our climate action plan, because I know that it is ... an area of interest.” This employee worked for a medium-sized county.

Money

Eight participants (67%) mentioned money as a barrier. For example, one of these participants said that cost is often the biggest barrier. They said they would love to have a solar panel pilot for a building but would need a grant. Another one of these participants explained that getting money for projects, like adding solar panels to city facilities, can be more difficult than it may appear.

Utilities

Two participants, both from counties, discussed utilities making it a challenge to use cleaner energy in their counties. One of these participants, who worked for a large county, said, “Utilities can be really difficult to work with, and when you are in a monopoly and you're forced to use a specific utility, it can be tough to ... make differences when it comes to the types of energy you're soliciting, not soliciting, the types of energy you're consuming.” The other of these two participants said, “North Carolina is a very sort of unique regulated energy market and so, because of the way we're structured as a ... local government, we have a very narrow path to succeed in what we're trying to do.” This participant, who worked for a county in the western part of the state, explained that North Carolina has a monopolized energy market and that local

government sustainability employees across the state communicate and collaborate with each other to find ways to overcome this barrier and achieve energy goals.

Slow pace of government

One participant said that a barrier to progress is that the government moves slowly and that they “have to get like 98 levels of permission to do things,” which not all residents may understand when pushing for the local government to do more to reduce climate actions more quickly. This participant worked in a county in the western part of the state.

Discussion

Key insight: many municipalities and counties are following IPCC strategies to talk about the real world and connect to what matters to audiences.

Several participants described strategies that aligned with two science communication strategies included in IPCC's evidence-based guide: talking about the real world rather than abstract ideas and connecting to what matters to audiences (Corner et al., 2018). Participants' responses aligned with the first of these two strategies when discussing ways they frame messages to reach different audiences as well as how they use clear language to communicate about specific climate initiatives people may see or ways they can act to slow climate change themselves. Participants' responses aligned with the second of these two strategies when explaining specifically how they framed climate initiatives to increase residents' receptiveness to them, with six using saving money as a frame and two emphasizing public health benefits. These two IPCC recommendations are supported by other literature on climate communication (Hayhoe, 2021). Also, one participant described using visuals, which aligned with another IPCC strategy, to use the most effective visual communication. A notable gap is the use of telling human stories; while participants discussed ways they make climate impacts personal when communicating with residents, they did not describe using anecdotes and stories as communications strategies (see Table 4). Following these recommendations can help with overcoming communications barriers, like climate change being polarizing and facts alone not motivating people to respond to climate change (Hayhoe, 2021).

Although the six participants who used saving money as a frame worked in municipalities and counties of varied sizes and with varied percentages of white and non-white residents, none reported that they believed that saving money was a strategy that would appeal to specific demographic groups. Interestingly, the two participants who mentioned public health worked in county government, which could reflect that those counties tend to manage public health initiatives more than towns and cities. Showing how climate initiatives are beneficial to residents connects to the idea that local governments do not necessarily have to change attitudes about climate change itself to involve residents in efforts to respond to the problem (Javelin et al., 2019).

Table 4: Alignment with IPCC communications strategies

IPCC Strategy	Number of Local Governments	Note
Talk about the real world, not abstract ideas	10 (83%)	The two local governments not included were large/central and small/coastal
Connect with what matters to your audience	7 (58%)	All were in western or central regions of NC
Use the most effective visual communication	1 (8%)	This local government is in the central Piedmont region and the smallest local government in study
Be a confident communicator	0	NA
Tell a human story	0	NA
Lead with what you know	0	NA

Authenticity is an aspect of another IPCC recommendation for climate communication - to be a confident communicator - though not the recommendation itself (Corner et al., 2018).

Authenticity also arose as a theme in communications strategies, such as when one participant mentioned the municipality needing to “walk its talk” and when another participant said solar panels were not put up just for show.

Participants’ responses suggest that local governments should share clear and understandable information with residents. Some participants noted the importance of transparency and having different materials for groups with different levels of education so people can understand initiatives and get more detail if they want. A unique strategy that one participant mentioned was to prepare tidbits of information that could be shared on social media platforms. Such a strategy could reach many people and not be too overwhelming.

Key insight: residents’ mistrust is a challenge in one of the most and one of the least racially and ethnically diverse municipalities/counties.

Two participants’ responses highlight that mistrust is a barrier some local governments face when communicating and engaging with residents but that a solution is partnering with trusted community leaders. Both participants worked for local governments for large counties or municipalities. However, these areas had different racial and ethnic makeups, which is notable since mistrust can be related to the ways local government has treated communities of color in the past, as one participant said. One of the participants, who specifically said mistrust occurred in communities of color and historically Black neighborhoods, worked in a county with a percentage of white residents above the state average and percentages of Black, Asian, and Latinx residents below the state average. The other participant, who did not directly connect mistrust to race, worked in a municipality with a percentage of white residents below the state average and percentages of Black, Asian, and Latinx residents above the state average. Mistrust

being mentioned in one of the most racially diverse and one of the least racially diverse municipalities/counties in the study shows that it is a challenge occurring in municipalities/counties with varied racial and ethnic makeups. A possible interpretation is that local governments for municipalities/counties at the different ends of the spectrum for racial and ethnic diversity are most sensitive to the issue of mistrust.

Key insight: channels vary depending on whether the primary goal is to share information or receive resident input.

The findings show some similarities and differences in channels for communicating about the environment and receiving resident input. While all participants said public meetings were a channel for receiving resident input, five participants said it was a channel for sharing information about climate initiatives. Some participants mentioned social media as a channel for sharing information and receiving resident input. It is important that social media is a common channel since it has been a key way local governments have shared information about natural disasters in North Carolina (Handa, 2019). Other channels were only mentioned as channels for sharing information or receiving resident input. These differences in sharing and receiving information raise the questions of whether and how sustainability employees are measuring the effectiveness of communications channels and whether they are reaching all or many residents.

Additionally, when describing channels for receiving resident input, participants noted following five American Planning Association strategies - all except for making engagement fun - for inclusive public meetings, but they did not mention APA specifically (Spivak, 2019).

There is further room to study how intentional municipalities and counties have been with channels. Of course, some channels only logically go one way. Newspapers make sense as only a way to share information and not receive resident input unless residents were to write opinion pieces or comment about articles on social media. On the other hand, social media is an example of a two-way communication channel, so it understandably came up for both uses.

Similarly, the existence of channels for communication and resident input may not mean they are used effectively. This concern comes from one participant suggesting that volunteers are scared to post on social media since they do not want to violate the social media policy and another participant directly saying social media was not used effectively prior to hiring a communications specialist. Plus, channels may be ineffective if used incorrectly. For surveys as a channel of receiving resident input, some participants said they are statistically accurate, but there could still be limits related to the ways questions are asked or the questions included.

Key insight: misconceptions were generally around climate impacts and responses rather than climate denial.

In contrast to literature about climate change as a polarizing topic, most participants did not describe significant misconceptions about whether climate change is real in their communities. Rather, misconceptions concerned how municipalities/counties could and needed to respond. The lack of climate denial among municipalities/counties of different sizes and regions suggests that the national polarization around climate change, as described in the literature review, is not as

evident in the municipalities/counties in this study (Hayhoe, 2021). Notably, participants who worked for the two communities with the lowest percentages of white residents and highest percentages of Black residents were the two participants who were quoted describing a lack of hearing misconceptions about climate change from residents in their municipalities/counties. Perhaps this discovery is a result of Black communities facing greater climate risks than white communities (US EPA, 2021).

Key insight: robust successful initiatives responding to climate change included funding, metrics, and partnerships.

Funding, metrics, and partnerships are factors that other local governments should consider when responding to climate change since these factors were common in robust responses. Three participants from municipalities/counties with strong responses describing successful climate initiatives included having money/not needing money and having metrics as elements that led to success. One of these participants said that funding led to the change, and another one of these participants connected the program being free with it being accessible as elements that led to success. The third participant explained how the municipality used an EPA document about setting goals and financing a plan. The initiative that two of these participants identified as successful was a goal with metrics itself. The other participant identified metrics as something they think will be helpful for making a pilot program permanent. These factors being common for leading to success suggest that other municipalities/counties should view them as key elements for implementing successful initiatives with public engagement.

Moreover, a participant who worked for a municipality that had established and robust responses to climate change - with several plans to respond in different ways - identified a successful program that involved partnership with a state government department and specific ways to implement the program like a comprehensive website, training, and clarifying language. This municipality's initiative highlights partnership as a way to successfully respond to climate change, and partnership is an element of successful sustainable development as described in the literature review (Brown et al., 2021). The municipality's response also shows the importance of not just planning a response to climate change but having communications and tactics in place to help implement the initiative, which connects with Meerow and Woodruff's (2019) principle of having processes for implementing initiatives responding to climate change.

Key insight: more participants described initiatives focused on mitigation than resilience when asked to identify a successful climate initiative with public engagement.

When asked to describe a successful initiative responding to climate change, more participants described climate mitigation initiatives, like clean energy goals, than resilience initiatives, like a resilience planning process. Participants' local governments may still be taking efforts toward climate mitigation or resilience even if they did not describe them in response to the question. The difference suggests that resilience initiatives may be newer and less successful so far compared to mitigation initiatives in some of the municipalities/counties.

Table 5: Number of mitigation and resilience initiatives described by participants

Region	Number of Local Governments Focused on Mitigation (n=10)	Number of Local Governments Focused on Resilience (n=2)	Note
Mountains	3 (30%)	0	Varied sizes – small, medium, and large
Central	6 (60%)	1 (50%)	The local government focused on resilience was large and one of the most racially diverse local governments in the study
Coastal	1 (10%)	1 (50%)	The coastal local government focused on resilience was smaller and had more racial diversity

While some participants discussed resilience plans to respond to climate change, they did not explicitly address having different scenarios planned. Meerow and Woodruff's (2019) seventh recommendation is to address the uncertainty of climate change by planning for different scenarios. This lack of evident flexibility in programming in the municipalities/counties suggests that local decision-makers are thinking of climate resilience as “bouncing back” rather than “bouncing forward,” as Meerow and Stults (2016) described, since flexibility is an element of “bouncing forward.” Also, the lack of flexibility suggests that municipalities/counties need to plan for uncertainty. If they are already planning for uncertainty, they need to make that evident in their descriptions of and communication about climate initiatives.

Key insight: an emerging theme was COVID-19 serving as a barrier and an opportunity for responding to and communicating about climate change.

The impact of COVID-19 on climate initiatives and communication about such initiatives was a theme that emerged in the interviews. Most participants who mentioned COVID-19 described it as a challenge, but one participant noted that it led to an opportunity: to connect with community members through the vaccination effort. This participant is one of only three participants who did not describe negative impacts of COVID-19 on their municipalities/counties. The other two of these municipalities/counties were ones determined to have particularly robust climate responses due to their funding, metrics, and partnerships. Participants interviewed over three months described impacts of COVID-19, although case numbers varied during this time as the Delta variant rose. This consistent theme despite different case numbers suggests that COVID-19 may be a long-term barrier. This theme creates room for future research about long-term impacts of COVID-19 on climate initiatives.

Key insight: participants described local governments as partially following a known effective process for community involvement in climate responses.

The literature showed a three-step process for creating democratic local community-based adaptation to climate change, and participants described municipalities/counties following the first two steps and partially the third step when describing ways they communicated and received resident input. Participants described the first step, providing clear and credible public information, when explaining strategies like using plain language and being transparent. Participants followed the second step, inviting the public to participate in decision-making processes, by having several channels for sharing resident input, particularly public meetings and citizens' committees and task forces. However, participants shared limited evidence of municipalities/counties taking the third step: offering financial support and incentives for participation as needed (Howes, 2018). Participants did explain financial incentives of initiatives, like when they described initiatives that could save residents money, but did not describe ways municipalities/counties were providing direct financial support for becoming involved in climate responses.

Key insight: equity appears to be a priority in climate communication and responses in some local governments.

Equity came up throughout interviews, such as in response to a question about how participants and local governments hear from a cross section of residents about climate initiatives. Out of 12 participants who mentioned equity efforts for their local governments, just four participants shared in-depth responses about efforts to increase equity. For example, one participant described weatherization efforts for residents' homes. Weatherization is one way to increase equity as it can reduce energy poverty (Harrison & Popke, 2011). Another equity effort was how a participant said that they communicate about environmental justice initiatives differently from other initiatives without the interviewer asking about environmental justice, suggesting that environmental justice is a priority for them. This participant worked for a county that was more racially and ethnically diverse than the state as a whole; it had a lower percentage of white people than the state average and higher percentages of Black, Asian, and Latinx people compared to the state.

Two participants discussed efforts to be inclusive in their task forces and committees; notably, these two municipalities/counties each had a percentage of white residents (between 60-80%) that was close to the state average of 70.6%. One of these two participants described racial equity and social justice as main aspects of their most successful initiative and that their county is one of few places with an initiative like theirs. This description suggests that this person views success for the county as promoting social justice and racial equity and perhaps as being a leader in climate efforts.

While further research could study the impact of these equity efforts, they could serve as examples of ways other communities could increase equity in their channels for communicating and receiving resident input. These efforts to increase equity can help North Carolina make progress toward United Nations Sustainable Development goals as such efforts can reduce poverty and inequities while responding to climate change (SDSN, 2021).

Key insight: participants identified an opportunity for further climate initiatives - more state policies requiring climate responses.

State policies could allow local governments to overcome barriers to climate change and give them justification for further responses to climate change since two participants said state and federal policies could justify and encourage further policies regarding sustainability and hazard mitigation. Participants viewed state policy as both a hindrance and opportunity. One participant said the state policy banning plastic bag bans was a hindrance; this ban exemplifies intrastate preemption as described in the literature review. On the other hand, two participants reported that having more state requirements would provide the justification their local governments needed to take sustainability and hazard mitigation steps. Having state and federal policies that encourage climate responses could help local governments overcome a lack of resident support and political will in local areas, helping these local governments take steps that limit their contribution to climate change and slow the anticipated effects of climate change. In addition, residents mentioned limitations of utilities and a monopolized energy market on clean energy initiatives, so changes to energy policy could allow local governments to have more control over how sustainably they source their energy.

Key insight: participants' limited capacity suggests a need for more staff responding to climate change.

More staff could help local governments overcome barriers to responding to climate change since participants expressed wanting to do more several times throughout the interviews but described a lack of capacity for doing more. A participant said they did not update the website since they are the only sustainability staff member. One participant even said they do not engage with residents. Additionally, hiring a communications specialist was instrumental in helping one municipality use social media to communicate about climate change. While some participants were the only staff members involved in sustainability, some participants noted other departments involved in climate responses, like how one municipality's emergency management department runs their hazard mitigation plans. At the same time, one participant brought up an important point that local governments have day-to-day responsibilities that are more urgent and more of a priority than responding to climate change. More staff could help local governments accomplish urgent responsibilities while also preparing for the future by implementing initiatives mitigating their contributions to climate change and increasing their resilience. It could also help local governments focused on internal climate goals to engage with residents beyond the limited extent that some participants described, helping reduce misconceptions and show further ways that residents can get involved in climate responses themselves.

Key insight: some participants valued the opportunity for their local governments to serve as examples for climate responses.

Two already noted that they want to serve as an example for other local governments to respond to climate change, such as when one participant said they want their resilience plans to help other local governments create climate resilience plans. It is notable that the two participants who said they wanted to serve as an example worked for local governments that were particularly focused on resilience work; one of the local governments was in a coastal area that had faced hurricane

damage, and the other local government had weatherization as a main program responding to climate change that had public engagement. A possible reason that the participants with foci on resilience work were the ones who mentioned wanting to serve as an example is because not all municipalities/counties in the study have begun resilience work. The participants in municipalities/counties focused on mitigation may think their work is less likely to serve as an example since other municipalities/counties are already doing mitigation work.

Overall, the findings and insights show ways participants and their local governments have communicated about climate responses and engaged the community, like how some have followed IPCC recommendations and partnered with community leaders to overcome mistrust. Equity has been an aspect of the ways some local governments receive resident input, such as through diverse task forces. The results also suggest areas for improvement with communication as part of successful climate responses. For example, participants may need to find ways to increase residents' understanding of how local governments can respond to climate change in order to reduce misconceptions. They have also faced COVID-19 and limited capacity as barriers for receiving resident input. When implementing initiatives with community engagement, local governments may use funding, metrics, and partnerships to be successful. Some participants already expressed that they want their local governments to serve as examples for other local government responses to climate change. The responses of all participants have indeed contributed to an understanding of the ways local governments respond to and communicate about climate change in the face of climate threats to the world and North Carolina (Devlin et al., 2014).

Limitations

This study had some limitations, particularly related to the small sample size and voluntary participation. The 12 sustainability employees who agreed to participate represented a subset of North Carolina local governments (in 11 of North Carolina's 100 counties). Snowball sampling could have introduced bias in that participants who knew each other may have shared characteristics or experiences that were different from those who did not participate. Similarly, this subset of employees may not be representative of all local government sustainability employees in the state. For example, sustainability employees in larger municipalities/counties might have had a greater capacity to participate if they were part of a larger staff, and their experiences may not be representative of smaller organizations. Some participants' identities differed from majority populations in their areas, which could limit their understanding of the perspectives of local populations regarding climate responses and equity. Also, some participants were new to their roles, which may have limited their insights. Moreover, each participant was interviewed online and only once, and poor Internet connection limited responses in one interview.

Efforts were made to counteract these limitations. In addition to snowball sampling, participants were identified through review of websites of municipalities/counties of various sizes and in locations throughout the state. Also, the Southeast Sustainability Directors Network was used to identify local governments with employees who addressed climate change. Additionally, local governments' websites were reviewed prior to the interviews, which provided insight into whether information shared by participants was consistent with local governments' online presence. The literature review also helped with recognizing whether participants' discussions of climate change responses aligned with literature on the topic.

Conclusion

These findings show that some North Carolina local government employees are using varied channels and strategies to communicate about climate change initiatives and receive resident input. While all participants were able to describe successful climate initiatives that included public engagement, they faced barriers in helping mitigate their local governments' contributions to climate change and increasing efforts to be resilient to climate threats. Common themes across interviews included: following IPCC recommendations for climate communication; residents having misconceptions about climate change responses rather than climate science; and robust climate initiatives involving funding, metrics, and partnerships. Other insights included the presence of mistrust of government in municipalities/counties with different racial and ethnic makeups, participants mostly identifying mitigation initiatives as climate initiatives with public engagement, COVID-19 as a barrier and opportunity for communication, local governments partially following best practices for community involvement in climate responses, local governments having a varied concern for equity, more state government requirements potentially helping local governments do more to respond to climate change, a need for more local government staff responding to climate change, and participants wanting their local governments to serve as examples for responding to climate change.

Accordingly, this study leads to recommendations for government responses to climate change. Local government sustainability employees, following IPCC recommendations, should continue to talk about tangible ways that climate change affects what residents care about. They should include clear language and more visuals as well as human stories. They should partner with community leaders to overcome mistrust. To implement successful climate initiatives with community engagement, they should have funding, metrics, and partnerships. They should add more staff tasked with climate responses to provide greater capacity for communicating with residents about initiatives. Additionally, the state government could require local governments to take further mitigation and resilience steps to respond to climate change, which would justify further action for local governments.

Limited research has been conducted on this topic, so this study has provided useful insight key to understanding how 12 North Carolina local governments successfully implement and communicate about climate initiatives. This study creates room for further research. Given differences between channels for communication and receiving resident input, one topic is how effectively local governments use channels like social media to communicate with residents and receive resident input about climate initiatives. Since some participants had little to say about resilience efforts and worked for local governments focused on mitigation, research could study how well local government sustainability employees understand the term "resilience" and the ways municipalities/counties can become more resilient while involving community engagement. Moreover, future research could be on ways residents are receiving and responding to messages about climate change at the local government level.

These findings can inform local governments' approaches to communication about climate initiatives by identifying factors that can help them be successful. These responses and strategies can mitigate the impacts of climate change and associated inequities and injustices on some

groups of people in North Carolina. Given the role of local governments in responding to threats of climate change, it is critical to understand how North Carolina local governments have recently had successful climate initiatives and communicated about them.

References

- American Lung Association. (2020, April 20). *Disparities in the impact of air pollution*. <https://www.lung.org/clean-air/outdoors/who-is-at-risk/disparities>
- Amsler, L. B., & Vieilledent, T. (2021, April 9). Collaborative governance in local government: How state law shapes community problem-solving through intrastate preemption. *Perspectives on Public Management and Governance*, 4(2), 159-169. <https://doi.org/10.1093/ppmgov/gvab007>
- Brown, K., Pipa, A. F., Rasmussen, K., & Bouchet, M. (2021, November 22). *Growing American leadership on the Sustainable Development Goals*. <https://www.brookings.edu/blog/up-front/2021/11/22/growing-american-leadership-on-the-sustainable-development-goals/>
- Center for Climate and Energy Solutions. (2019, April). *What is climate resilience, and why does it matter?* <https://www.c2es.org/document/what-is-climate-resilience-and-why-does-it-matter/>
- Clifton, R., & Kelly, C. (2020, September 9). *Building a just climate future for North Carolina*. Center for American Progress. <https://www.americanprogress.org/article/building-just-climate-future-north-carolina/>
- Corner, A., Shaw, C., & Clarke, J. (2018, January). *Principles for effective communication and public engagement on climate change*. Climate Outreach. <https://www.ipcc.ch/site/assets/uploads/2017/08/Climate-Outreach-IPCC-communications-handbook.pdf>
- Danis, C. M., Fernandes, T., & Thompson, O. P. (2019). *Place, perception, or politics?: Measuring U.S. urban-rural natural disaster resilience capacity*. University of North Carolina at Charlotte. https://ic-sd.org/wp-content/uploads/2019/11/christina_danis.pdf
- Devlin, L., Goralnik, M., Ross, W., & Tart, K. T. (2014, June). Climate change and public health in North Carolina: A unique state offers a unique perspective. *Environmental Health Perspective*, 122(6), A146-A147. <http://dx.doi.org/10.1289/ehp.1408542>
- Handa, S. (2019, June 17). *Analysis of Twitter usage by governmental actors in North Carolina Florence Recovery* [Master's paper, University of North Carolina at Chapel Hill]. Carolina Digital Repository. <https://doi.org/10.17615/z9r6-j270>
- Harrison, C., & Popke, J. (2011, May 11). "Because you got to have heat": The networked assemblage of energy poverty in eastern North Carolina. *Annals of the Association of American Geographers*, 101(4), 949-961. <https://doi.org/10.1080/00045608.2011.569659>

- Hayhoe, K. (2021). *Saving us: A climate scientist's case for hope and healing in a divided world*. One Signal Publishers / Atria.
- Hornsey, M. J., Harris, E. A., Bain, P. G., & Fielding, K. S. (2016, February 22). Meta-analyses of the determinants and outcomes of belief in climate change. *Nature Climate Change*, 6, 622-626. <https://www.nature.com/articles/nclimate2943>
- Howes, M. (2018, March 21). Transforming climate change policymaking: From informing to empowering the local community. *Communicating Climate Change Information for Decision-Making*, 139-148. https://link.springer.com/chapter/10.1007/978-3-319-74669-2_10
- Intergovernmental Panel on Climate Change. (2018). Summary for Policymakers. In *Global warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty*. <https://www.ipcc.ch/sr15/chapter/spm/>
- Intergovernmental Panel on Climate Change. (2021a). *The Intergovernmental Panel on Climate Change*. <https://www.ipcc.ch/>
- Intergovernmental Panel on Climate Change. (2021b). Summary for Policymakers. In *Climate change 2021: The physical science basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_SPM_final.pdf
- Javelin, D., Kijewski-Correa, T., & Chesler, A. (2019, September 5). Does it matter if you “believe” in climate change?: Not for coastal home vulnerability. *Climatic Change*, 155, 511-532. <https://doi.org/10.1007/s10584-019-02513-7>
- Jun, K., & Bryer, T. (2016, April 15). Facilitating local government participation in local government in hard times. *The American Review of Public Administration*, 47(7), 840-856. <https://doi.org/10.1177/0275074016643587>
- Kelley, B. K. (2018). *Local bureaucrats and climate change adaptation* [Doctoral dissertation, Syracuse University]. ProQuest Dissertations Publishing. <https://www.proquest.com/docview/2088110230?pq-origsite=gscholar&fromopenview=true>
- Kunkel, K. E. (2020, September 3). *North Carolina climate science report*. North Carolina Institute for Climate Studies. https://climate.ncsu.edu/learn/wp-content/uploads/sites/3/2020/12/NCCSR_Extension_Kunkel_Sept_3_2020_reduced.pdf
- Lindsey, R. & Dahlman, L. (2021, August 12). *Climate change: Global temperature*. NOAA Climate.gov. <https://www.climate.gov/news-features/understanding-climate/climate-change-global-temperature>

- Logan, T. M., & Guikema, S. D. (2020, May 13). Reframing resilience: Equitable access to essential services. *Risk Analysis*, 40(8), 1538-1553. <https://doi.org/10.1111/risa.13492>
- Marlon, J., Howe, P., Mildenerger, M., Leiserowitz, A., & Wang, X. (2020, September 2). *Yale climate opinion maps 2020*. Yale Program on Climate Change Communication. <https://climatecommunication.yale.edu/visualizations-data/ycom-us/>
- Meerow, S., & Stults, M. (2016, July 21). Comparing conceptualizations of urban climate resilience in theory and practice. *Sustainability*, 8(7), 7-1. <https://doi-org.libproxy.lib.unc.edu/10.3390/su8070701>
- Meerow, S., & Woodruff, S. C. (2019, December 6). Seven principles of strong climate change planning. *Journal of the American Planning Association*, 86(1), 39-46. <https://doi-org.libproxy.lib.unc.edu/10.1080/01944363.2019.1652108>
- Morris, B., Chrysochou, S. K., & Mitkidis, P. (2020). Optimistic vs. pessimistic endings in climate change appeals. *Humanities and Social Sciences Communications*, 7. <https://www.nature.com/articles/s41599-020-00574-z>
- Sampson, N., Schulz, A., Parker, E., & Israel, B. (2014, April). Improving public participation to achieve environmental justice: applying lessons from freight's frontline communities. *Environmental Justice*, 7(2), 45-54. [10.1089/env.2014.0004](https://doi.org/10.1089/env.2014.0004)
- Sharot, T. (2017). *The influential mind: What the brain reveals about our power to change others*. Henry Holt and Co.
- Spivak, J. (2019, March). *6 tips for inclusive public meetings*. American Planning Association. <https://www.planning.org/planning/2019/mar/6tipublicmeetings/>
- Southeast Sustainability Directors Network. (n.d.). *Building solutions in the South*. <https://www.southeastsdn.org/>
- State of North Carolina. (2020, June). *North Carolina climate risk assessment and resilience plan*. NC Department of Environmental Quality. <https://files.nc.gov/ncdeq/climate-change/resilience-plan/2020-Climate-Risk-Assessment-and-Resilience-Plan.pdf>
- Sugg, M., Anderson, L., Shay, E., Tyson, J. S., & Runkle, J. (2021, March). Climate, environment, and public health in western North Carolina. *Journal of the Blue Cross NC Institute for Health and Human Services*, 1, 1-85. https://libres.uncg.edu/ir/asu/f/Journal%20of%20the%20Blue%20Cross%20NC%20Institute%20for%20Health%20and%20Human%20Services_Vol_1_Summer_2021.pdf#page=77
- Sustainable Development Solutions Network. (2021, November). *United States sustainable development report 2021*.

<https://s3.amazonaws.com/sustainabledevelopment.report/2021/United+States+Sustainable+Development+Report+2021.pdf>

United States Census Bureau. (2020, April 10). *QuickFacts*.

<https://www.census.gov/quickfacts/fact/table/US/PST045221>

United States Environmental Protection Agency. (2021, September). *Climate change and social vulnerability in the United States*. https://www.epa.gov/system/files/documents/2021-09/climate-vulnerability_september-2021_508.pdf

Wolff, R. (2021, April 20). *Historic preservation and the plan integration for resilience scorecard: Case study in New Bern, NC* [Master's paper, University of North Carolina at Chapel Hill]. <https://doi.org/10.17615/gqhe-cb58>

Woodruff, S. C., Schwab, A. K., & Sandler, D. (2013, June). *Adapting to climate change: A handbook for local governments in North Carolina*. Coastal Hazards Center at the University of North Carolina at Chapel Hill. <http://coastalhazardscenter.org/dev/wp-content/uploads/2013/06/adapt.pdf>