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# Buyout programme experiences and perspectives of local public officials in eastern North Carolina

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## ABSTRACT

Eastern North Carolina (ENC) has been buffeted by compound coastal water events (CCWEs) making residential buyouts, that seek to move households and communities out of flood risk areas, an important flood hazard mitigation tool. However, little is known about the experiences of local public officials implementing buyout programmes in rural coastal regions such as ENC in the United States. Using data from focus group interviews conducted with 24 emergency managers, planners, elected officials, and other public officials, we examine residential buyout programmes in ENC from the perspective of local public officials. According to ENC officials, while property attachment, social ties in the community, and financial considerations are key drivers for residential property owners in rural ENC considering a buyout, the governance of buyout programmes remains a complex lengthy process lacking adequate communication and leads to uncertainties for local public officials and property owners during the buyout. The uncertainty can be temporal, economic, or related to housing security. ENC officials recommend providing alternative mitigation options for small rural communities and simplifying and streamlining the buyout process along with improving communication throughout the buyout cycle to mitigate uncertainties in the buyout programme.

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## Introduction

Floods account for over 80% of all recorded disaster losses in the United States (U.S.) (Landry & Li, 2012). Rural coastal regions such as eastern North Carolina (ENC) have repeatedly suffered from recurring hurricanes and floods that have increased in frequency and severity (Curtis et al., 2022). For instance, ENC experienced Fran in 1996; Floyd in 1999; Irene in 2011; Matthew in 2016; and Florence in 2018 (Gori et al., 2020; Horney et al., 2014). Hurricane Floyd in 1999 destroyed about 8000 homes and damaged 67,000 more (Bin & Polasky, 2004; Fraser et al., 2003; Wral, 2009). In 2016,

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Hurricane Matthew damaged about 100,000 homes in central and eastern North Carolina (Musser et al., 2017; Spialek et al., 2019), and during Hurricane Florence in 2018, an estimated 74,563 structures were flooded in North Carolina, including in ENC (NOAA, 2018). De Polt (2021) describes these storms and subsequent flooding as compound coastal water events (CCWEs), where the combination of the events, temporally and spatially, have led to compounding of impacts in rural ENC. The flood events have led to over 1600 residential property buyouts in North Carolina, of which 1537 buyouts were in the ENC region in our participant counties (Fraser et al., 2003; NPR, 2019).

Thirteen million Americans are projected to be underwater by 2100 (Hauer et al., 2016; Siders et al., 2021), rendering voluntary buyouts an important climate change adaptation and hazard mitigation tool. The buyout programme in the U.S. is a form of managed retreat (Siders, 2019). The FEMA buyout programme is among the oldest managed retreat programme globally (Mach et al., 2019), existing since 1988 through the Hazard Mitigation Grant Programme (HMGP) under Section 404 of the Stafford Act (Elliott et al., 2020; Godschalk et al., 1999; Mach et al., 2019; Maly & Ishikawa, 2013; Nelson & Molloy, 2021; Tate et al., 2016).

In this work, we look at the unique challenges and impacts of residential property buyouts through the perspective of local public officials in rural ENC. Our work contributes to the current scholarship in three primary ways. First, the focus of this study is on rural coastal communities in ENC. Research on buyout programmes and their implementation in rural communities in the U.S. is considerably thin compared to that of buyouts in urban areas, even though studies suggest that managed retreat is likely to occur in more rural areas (Lincke & Hinkel, 2018). There is no clear definition of the term rural or a clear delineation of the bounds of rurality in the literature (Jerolleman, 2020). Instead, the term is ambiguous and is used to represent that which is not urban (Miller, 2013; US Census, n.d.). Rural and urban areas experience climate hazards differently and have widely differing contexts. Rural areas are more isolated with lower access to health infrastructure (Lal et al., 2011) and 'tend to have older, less affluent, and less educated populations, limited financial and human resources, and weaker relationships with state and federal agencies than urban areas' (Consoer & Milman, 2018, p. 142). Second, we look at the experiences of local public officials and the challenges they face during the implementation of buyout programmes in rural ENC. While numerous studies have looked at the buyout process and its challenges from the perspective of buyout participants, there is little research on the experiences of local government officials implementing the buyout programmes (Binder et al., 2020). However, this is critical in understanding choices, constraints, and policy priorities at the local level. Third, our study considers the impacts of buyout programmes in rural coastal communities buffeted by CCWEs. The current set of scholarship does not consider how mitigation policies, including buyouts, their governance and associated challenges intersect with the impacts of compound floods in rural communities leading to mid-to long-term economic and health impacts such as financial difficulties and mental and physical health issues (Baker et al., 2018; Mukherji et al., 2023).

We frame our findings through Marino's (2018) theoretical lens of ethnocentrism in relocation and retreat policies in the U.S. Marino (2018, p. 10) argues that 'notions of

the market property, and individualism are ideological assumptions inherent to the buyout policies' which disadvantages certain communities and 'can limit the inventory of possibilities that some communities have to choose from and re-entrench inequity in the face of risk.' While Marino's work looks at tribal communities in Alaska, we use their framework to examine voluntary buyouts in small rural communities in ENC. Rural communities are particularly vulnerable to extreme weather events associated with climate change, such as more intense rainfall and frequent flooding (Waugh, 2013). Furthermore, the context and capabilities for climate change adaptation in rural areas are different (Cutter et al., 2016). Yet, the vulnerabilities and pathways to resilience in rural regions are less well studied and understood as compared to their urban counterparts (Cheng et al., 2015; Cutter et al., 2016) and their unique challenges are largely overlooked (Jerolleman, 2020).

We begin with an overview of buyout programmes in the U.S. focusing specifically on the buyout process and its governance and note some of the challenges of buyout programmes. We then introduce our research methods based on a focus group held in February 2022. Our study results, based on the perspective of local officials, indicate that while property attachment, social ties in the community, and financial considerations are key drivers for residential property owners in rural ENC considering a buyout, the governance of buyout programmes remains a complex lengthy process lacking adequate communication and leads to uncertainties for local public officials and property owners during the buyout. The uncertainty can be temporal (e.g. not knowing how long it will take for the buyout application to be approved), economic (e.g. financial hardships for buyout participants and uncertainty of funding while waiting for the buyout), or related to housing security (e.g. buyout participants living in damaged, temporary, or other housing arrangements for unspecified duration while waiting for the buyout). According to ENC officials, the layers of uncertainties for local officials and programme participants in turn has perceived health and economic impacts on buyout participants, compounding the effects of CCWEs on communities in rural coastal ENC.

## Buyout programmes in the United States

The mitigation approaches to reduce the impacts of hurricanes and flooding in urban and rural communities can be broadly grouped into structural and non-structural approaches (Ahmadiani et al., 2019; Cigler, 2017; Landry & Li, 2012). Structural mitigation includes large, engineered projects such as dams, levees, and channel improvements. Non-structural approaches include land-use planning, purchasing flood insurance, approving zoning and building codes for safer construction, installing flood warning systems, and implementing managed retreats (Landry & Li, 2012). Since the late 1980s, the Federal Emergency Management Agency (FEMA) has spent over \$13 billion assisting communities in implementing long-term mitigation projects, primarily through structural approaches (Ahmadiani et al., 2019). However, the negative environmental effects and huge cost of implementation have shifted the emphasis at the federal level to nonstructural approaches (Landry & Li, 2012), and they are becoming more common (Consoer & Milman, 2018). Buyout efforts are considered a non-structural approach (Mach & Siders, 2021; Thaler, 2021).

### *The voluntary buyout process and governance*

In the U.S., buyout programmes aim to reduce future hazard risk by acquiring residential properties in flood-vulnerable areas and relocating the impacted homeowners to less risky areas (Greer & Binder, 2017; Robinson et al., 2018). Federally funded through FEMA's HMGP, buyout programmes are also voluntary, which means that residential property owners cannot be required to participate in a buyout programme (Greer & Binder, 2017). However, because residential property owners often face pressure to participate, the voluntary aspect of the buyout programme has been called into question (de Vries & Fraser, 2012).

Despite being in existence since the 1980s (Tate et al., 2016), the active exploration of the buyout programme as a nonstructural mitigation approach began after the 1993 Midwest flooding of the Mississippi and Missouri rivers (Greer & Binder, 2017; Robinson et al., 2018; Tate et al., 2016). The Midwest floods led to the amendment of the Stafford Act and the passage of The Hazard Mitigation and Relocation Assistance Act (Robinson et al., 2018). The amendments ensure that 15–20% of the federal assistance relief funds are allocated to mitigation, including buyouts (BenDor et al., 2020; Tate et al., 2016), and increase the federal cost share of funding residential buyouts from 50% to 75% (Conrad et al., 1998; Tate et al., 2016). Since then, over 43,000 residential properties have been bought out in three territories and 49 states, except for Hawaii (Elliott et al., 2020; Mach et al., 2019; McGhee et al., 2020).

The governance of a buyout programme involves all tiers of government, non-governmental organisations, and impacted communities (Greer & Binder, 2017). A presidential disaster can be declared following a recommendation by the state's emergency management division. Once a declaration is made, the impacted community (i.e. town, city, or county) can decide what is the most suitable hazard mitigation approach for their community, usually through the FEMA's HMGP. The HMGP funds various activities, including retrofitting buildings, elevating homes, enforcing stricter building codes, and the buyout programme (Greer & Binder, 2017). If a community decides to implement the buyout programme, the buyout administrators in the community are then tasked with collecting and organising the necessary application documents from the impacted homeowners. State governments may also implement and manage buyout programmes for local communities. Applicants are expected to meet certain eligibility criteria, and many flooded properties are not eligible for a buyout (FEMA, 2018). Applicants must sign the voluntary participation form, have flood insurance, have experienced repetitive floods, be in the special flood hazard area (SFHA), and the property value must be less than USD 323,000. If not in the SFHA, the benefit–cost assessment (BCA) must indicate that the property has been damaged beyond 50% of the property value (Robinson et al., 2018).

Emergency Management (EM) divisions at the state level review the application documents submitted by the communities within their jurisdiction (FEMA, 2018; Robinson et al., 2018) to verify the impacted property's address, photographs of the existing situation, the environmental and historical reviews, and the budget. Furthermore, the selection criteria can vary from one buyout to the next. Once their review is complete, the EM division submits the reviewed applications to FEMA's HMGP (FEMA, 2015; Greer & Binder, 2017). FEMA then examines the applications, including their cost-effectiveness, policy adherence, and historic preservation mandates (Greer & Binder, 2017). If approved,

FEMA, through the HMGP, will typically fund 75% of the total buyout cost, including the pre-flood fair market value and the real estate transaction costs (Atoba et al., 2021; BenDor et al., 2020; de Vries & Fraser, 2012; FEMA, 2015; Fraser et al., 2006; Godschalk et al., 1999; Greer & Binder, 2017; Maly & Ishikawa, 2013; Robinson et al., 2018; Zavar & Hagelman, 2016). If an approved homeowner is unsatisfied with their property's pre-flood fair market value, they can appeal, and the property will be re-appraised (FEMA, 2015). If an approved homeowner still owes a mortgage on the damaged property, the homeowner will receive the residual funds after paying the lienholder (FEMA, 2015). The remaining 25% is the responsibility of the local community and/or the state government or, in some cases, the homeowners (Atoba et al., 2021; de Vries & Fraser, 2012; Fraser et al., 2006; Greer & Binder, 2017; Robinson et al., 2018; Zavar & Hagelman, 2016). While some states source the remaining 25% from HUD's CDBG-DR funds (Greer & Binder, 2017; Peterson et al., 2020), North Carolina is one of the few states that match the 25% through the State Emergency Response and Disaster Relief Fund (STRDF). Under the best-case scenario, a buyout process is expected to span seven to 18 months (FEMA, 1998; Robinson et al., 2018), however, the process currently takes anywhere from three to six years. As per FEMA regulations, the properties acquired using HMGP funds, must be deed-restricted against structural development and converted to an open space in perpetuity, for uses such as recreational space, wetlands, and floodplains restoration (Conrad et al., 1998; FEMA, 2015; Robinson et al., 2018; Tate et al., 2016).

### *Challenges and impacts of buyout programmes in the United States*

Baker et al. (2018) categorise three phases of the buyout experience, the pre-buyout, the post-buyout, and the peri-buyout period, with most research on buyouts falling into the pre-buyout and post-buyout phases. Pre-buyout research has focused on the factors responsible for the acceptance or rejection of buyouts (e.g. Baker et al., 2018; Binder et al., 2015; Binder & Greer, 2016; de Vries & Fraser, 2012; Elliott et al., 2020; Fraser et al., 2003, 2006; Kick et al., 2011; Knobloch, 2005; Robinson et al., 2018). Research on this phase also looks at the driving factors for migration from flood risk areas (e.g. Correll, Lam, Mihunov, Zou, & Cai, 2021; Schwaller & BenDor, 2021). Studies on post-buyout have assessed the history, process, cost-effectiveness, social equity, and performance of buyouts (e.g. Baker et al., 2018; Binder & Greer, 2016; Fraser et al., 2006; Godschalk et al., 1999; Greer & Binder, 2017; Maly & Ishikawa, 2013; McGhee et al., 2020; Nelson & Molloy, 2021; Tate et al., 2016). Post-buyout studies also include the impact of the buyout on homeowners and the advantages and challenges of buyouts (BenDor et al., 2020; Calil et al., 2015; Knobloch, 2005; Mach et al., 2019; Zavar & Hagelman, 2016). The peri-buyout phase, focusing on the lived experience of residents during the buyout process and closely tied to programme design, has been largely overlooked within this body of scholarship (Baker et al., 2018).

Baker et al. (2018), in their study of home buyout programmes in Oakwood Beach, New York, after Hurricane Sandy, found that buyout participants' experiences during the peri-buyout phase were affected by a lack of communication from buyout officials, by challenges related to the process of property sale, and the tendency to consider buyout as a foregone conclusion among public officials. Other studies on the peri-buyout phase have found that the long buyout process, lack of communication and

trust in buyout administrators, few opportunities for community involvement, confusion over buyout guidelines, and programme design decisions have influenced participants' experiences (Binder et al., 2020; de Vries & Fraser, 2012; Fraser et al., 2003; Perry & Lindell, 1997).

Furthermore, the mid- or long-term impacts of a buyout programme on participant communities have been largely unaddressed (Baker et al., 2018). A few studies have identified the economic, social, and health (physical and mental) impacts of post-disaster permanent displacement (e.g. Binder et al., 2019; Dannenberg et al., 2019; Fothergill & Peek, 2012; Hori & Schafer, 2009; Mortensen et al., 2009). For instance, Binder and their research team (2019) note long-term social costs of buyout programmes. Following buyout participants for three years after Hurricane Sandy, they found that place-based ties and social networks that can help individuals cope with disaster impacts, are diminished for buyout participants hindering their long-term recovery. However, scholarship on the mid- to long-term impacts of residential buyout programmes on participating communities is very limited. The success of buyout programmes is determined largely through cost-benefit analyses that ignore the lived experiences of buyout participants (Binder et al., 2019).

Studies on buyout programmes have also focused mainly on the experiences of participating property owners and not on that of government officials implementing the programmes (Binder et al., 2020). Government agencies at the state, county, or municipal levels typically apply for, implement, and manage federal buyout programmes. Yet, little is known about their internal processes and experiences throughout the buyout cycle (Binder et al., 2020). A lack of cohesive best practices and inadequate policy learning currently define the buyout programme (Greer & Binder, 2017). Moreover, there is little understanding of the differences in viewpoints among various stakeholders, such as public officials who might prioritise flood mitigation as a goal of buyout programmes, as opposed to homeowners who see the buyout as a means of recovery (Binder et al., 2020). Studies on post-disaster relocation due to sea level rise but not related to the buyout programme suggest that local leaders perceive relocation decisions as driven by pre-disaster challenges, such as lack of affordable housing, low wages and high cost of living, that are exacerbated by conditions after a disaster event (e.g. Kuru et al., 2022). Insights into the specific challenges of buyout programmes from the perspective of public officials thus remain scarce.

As in the United States, globally, studies that examine voluntary relocation from the perspective of local public officials is limited. The literature focuses mainly on participant households and finds that voluntary relocation as a climate change adaptation strategy is available to some within a range of responses, but not always an option due to family commitment, livelihood opportunities, financial constraints, and emotional ties (King et al., 2014). Moreover, the implementation of financial schemes for household recovery from flood events, including voluntary relocation, retains inherent contradictions leading to decision-making dilemmas, insufficient policy coordination, and missing links between disaster aid payments and compensation for planned relocation. This results in the benefits of such financial schemes not accruing to those who are the most in need (Slavíková et al., 2021; Thaler & Fuchs, 2019).

Due to the intensifying impacts of climate change, the use of federal mitigation programmes such as voluntary residential buyouts as a key tool for migration from flood



risk areas is expected to increase. The need to understand the broader impacts and the efficacy of buyout programmes is thus more important than ever. In this study, we offer a contribution towards identifying the challenges experienced by public officials during the peri-buyout phase of buyout programmes in rural ENC, a region buffeted by the compounding impacts of CCWEs.

Data collection and methods

Study data was collected during a full-day focus group interview session held on the East Carolina University campus in Greenville, North Carolina, in February 2022. IRB approval (#UMCIRB 19-002099) for the research was obtained from the ECU IRB and informed consent was obtained from all subjects during the focus group interview (Creswell, 2007). Participants in the focus group interview were emergency managers, planners, elected officials, and other public officials from the ENC region (e.g. from public works and health). We had 24 participants representing three Regional Planning Councils (Mid-East Commission, Albemarle Commission, and Upper Coastal Plain) and three Emergency Management Divisions (Eastern-1, Eastern-2, and Central-7). Participants were divided into seven groups per session, consisting of 3–6 participants per focus group interview, including a facilitator and a note taker. We had two sessions: Session 1 one in the morning and Session 2 in the afternoon. The 2022 focus group interview session was a follow-up to a previous focus group interview conducted in February 2020 just before the COVID-19 pandemic led to a state-wide shut down in North Carolina. Study findings from the 2020 focus group interview were presented to the ENC community during both sessions. Each session was 90 min, with the first 20 min set aside to present 2020 findings, the next 65 min for focus group interview, and the final 5 min to wrap-up and for session facilitators to regroup. The participants’ breakdown is provided in Table 1 and the interview questions for Session 1 and Session 2 are given in Table 2.

Session 1 focused on geographic approach to flood hazard. Participants were divided according to their regional Council of Governments (CoGs) in Session 1 to solicit geographically clustered feedback on location-specific flood risk and issues related to community health and economics. The 2020 focus group findings related to flood risk, severity and causes, and the economic and health impacts of CCWEs were presented in this session. Participants were also asked about flood risk assessment tools, and the health and economic vulnerability metrics and resources most useful to the ENC community.

Session 2 focused on flood mitigation, especially buyouts. Participants were divided according to their profession or responsibility to better understand how mitigation approaches could be more strategic, and what policies, tools, and data could help communities become more resilient. The 2020 focus group findings related to mitigation

Table 1. Breakdown of focus group participants according to profession and gender.

Focus group 2022	Planner	Emergency management	Elected official	Other official	Private entity
Female	3	1	3	2	0
Male	4	0	2	5	4
Total	7	1	5	7	4



**Table 2.** Questions for 2022 focus group interview participants during Session 1 and Session 2.

Session	Questions related to tools and resources for resiliency
Session 1: (Participants grouped according to CoG regions)	<p>What is your reaction to the presentations? Does it agree you're your experiences? Is there anything that is surprising?</p> <p>What flood risk assessment tools would be most helpful to you and in what format?</p> <p>What health/economic vulnerability metrics and resources would be most helpful to you and in what format?</p>
Session 2: (Participants grouped according to profession)	<p>What is your reaction to the presentations? Does it agree with your experiences? Is there anything that is surprising?</p> <p>What is your opinion on buyouts? What are the economic/health implications of the timeline of the buyouts?</p> <p>What are people doing locally to protect themselves or reduce vulnerability? Are residents and businesses finding low-cost flood mitigation solutions on their own?</p> <p>What policy instruments would you suggest at the state and federal levels to support resilience to compound flooding?</p> <p>How can funding mechanisms or streams be improved? Would the tools mentioned in the morning session be helpful in securing funding?</p>

barriers were presented. Participants were then asked about their experiences with buyouts and the impacts of the buyout programme in their communities. They were also asked about policy suggestions related to mitigation, including buyouts, that would be most useful to ENC communities. Participant response was clustered according to different stakeholders such as planners, emergency managers, and other public officials who have differing roles during CCWEs.

Facilitators asked a predetermined series of semi-structured questions in each focus group interview, and notetakers took handwritten notes to capture key points. All meetings were audio recorded and transcribed into text documents, with an average of 25 pages of conversation transcript for each focus group interview table which was then coded. In qualitative research, a code is a subtle expression representing a summary and value of a piece of language based on data, including but not limited to interview transcripts, journals, and photographs (Saldaña, 2009). We employed two cycles of qualitative analysis (Curtis et al., 2022), a first cycle of descriptive coding (Saldaña, 2009; Sou et al., 2021) using NVivo, a qualitative analysis software, and a second cycle of pattern coding completed in MS Word (Miles & Huberman, 1994). Descriptive coding describes the main theme of a passage in a few words or brief phrases (Saldaña, 2009). Pattern coding is to discern patterns in events and relationships in a dataset (Miles & Huberman, 1994). We derived over 120 codes (nodes in NVivo) inductively through an iterative process during first cycle descriptive coding of the focus group interview transcripts (from both morning and afternoon sessions) touching mainly upon metrics, tools, policies, and resources for resiliency (including for buyouts) and associated challenges. From the 120 codes derived, 11 codes (NVivo nodes) were related directly to buyouts. Each buyout-related code (or a node in NVivo) had anywhere from 5 to 62 references (relevant textual content from the transcripts) coded under it, with a median of 20 references. A second cycle of coding (pattern coding) followed the first cycle of descriptive coding to infer the patterns or themes that emerged from the first cycle codes. The key study findings presented in the next section are only those that emerged during the pattern coding and are related to the buyout programme.

## Perspective of local officials on buyouts in eastern North Carolina

The focus group interview discussion about buyouts started by asking participants about the buyout programme, in particular the economic and health implications of the buyout timeline. Responses varied among participants, with some satisfied and others expressing their reservations about the programme. Several participants highlighted its advantages as an effective mitigation approach due to green space restoration, repetitive flood prevention and flexible land usage. One participant stated that a buyout 'meets the program's main goal, getting people out of harm's way' and reduces the need 'to continually go back in, send [...] emergency management folks in during the height of the storm to rescue folks.' According to another participant, because FEMA policy states that land vacated through buyouts should remain open space in perpetuity, 'buyouts create green space.' ENC communities have converted buyout properties into parks and trails and leased them to adjoining property owners to keep them maintained. For instance, a participant from Windsor explained:

Windsor, we put disc golf courses up. There is a campground that they are putting in, or expanding, in Windsor. There is a zoo in Windsor. There are places in Duplin County where they just lease it to farmers, and it just gets farmed. So, condemned is not, again, another word you want to use. Because the property can be used for some stuff.

However, participants also noted that 'buyout causes a lot of problems.' Results from the focus group interview data show that, from the perspective of public officials, challenges during the peri-buyout phase of the programme include three interrelated aspects – one, the rejection of a buyout offer by property owner for reasons such as property attachment, social ties in the community, financial considerations, and lack of appropriate documentation; two, a complex, lengthy process lacking appropriate communication that leads to uncertainties during the buyout for local public officials and property owners; and three, perceived health and economic impacts of the buyout process on participants that compounds the effects of CCWEs on communities in rural coastal ENC. Study participants suggested streamlining the process and improving communication to mitigate the uncertainties in the buyout programme.

### *Rejection of buyout offer*

Participants discussed several factors why impacted homeowners decide against enrolling in a buyout programme in ENC. Attachment to their properties for various reasons influences a property owner's decision to reject participation in a buyout. As one participant said, 'you think people are going to move and go away? They are attached to their house just like you are.' Homeowners whose properties that have been in the family for generations are more likely to reject a buyout due to emotional attachment to the property and to protect their family history.

There are people whose families that lived in North Carolina for 350 years when they washed up in the ship. And they have had the same view for three and a half centuries, and it is beautiful, and they are not ready to leave.

'Emotional attachment to a house is a top reason the black folk would do it' according to a public official on why minority households are likely to reject a buyout. Participants

believe that historical and institutional barriers related to racial injustice that prevented black households from owning property meant that homes that were in the family for generations symbolised their struggles and were an integral part of Black history and property ownership. As another official shared:

I have a house that family is no longer ... Even no one is even living in it, and it is vacant. They take care of it. I mean, it is not one so bad run down. I mean, they mow the grass, they do what they are supposed to, but the siblings, none of them live there, but they are not willing to participate in a buyout because of their great grandfather. And this is African Americans; when they could not buy property, he was one of the first ones to buy that piece of property. So, you got this. We are not going to sell it. I do not care what happens there. We are not going to sell it because my great-granddad was able to get this thing.

Other reasons for homeowners to opt out of the buyout programme include a lower property appraisal value combined with a fair market price presented by the buyout administrators that is less than what the homeowners expect their property to be worth. According to one participant 'over the last 24 years, maybe one in 10 opt-out, and the most common reason is my property's worth more than that.' Homeowners might reject a buyout if they realise that the appraisal value is not enough to get them a similar property elsewhere or if 'they have got somebody else that's come in and offered them money for it, cash.' A participant elaborated:

We have a lot of survivors that are worried that if you buy my house fair market value or whatever, am I going to be able to want two things; afford something else around here or somewhere else, and two, is there enough available to me and the other people being bought out?

Lack of adequate property documentation is another reason for homeowners to decide against opting for a buyout. For instance, some homeowners face difficulty providing accurate property title documentation which can happen due to property transfer among generations leading to title misplacement or unmatched title names. A participant stated 'You have got title issues on the property. So, every property has to go through a title opinion, and if you have got errors and everything else, you may not be able to sell the property.'

Focus group interview participants also identified the fear of uncertainty as a factor for some homeowners to reject the offer of a buyout. 'To get folks to buy into this is serious is hard sometimes [...] They do not want to leave for fear.' The fear could be attributed to the loss of social networks. A participant explained that 'Yeah. I think one reason that people do not participate in the buyout is because these networks that they have are ... Best way to say, they are not traditional or formal networks. They are social networks, informal networks of community.'

### *Lengthy process lacking communication and resulting uncertainties*

Participants strongly agreed that the governance of the buyout programme is complex and characterised by a lengthy process and lack of adequate appropriate communication that in turn creates uncertainties for local public officials and buyout participants. The average duration of a buyout programme has extended to five years from the stipulated less than three years. A participant explained:

In the Hazard Mitigation Grant Program, FEMA will not accept an application for 12 months after the declaration. So, there is a year already. Then it takes a year to get the application developed and approved. So, with 24 months, we go to the local government and say, you have got three years to execute. So, that is where five years comes from.

Participants cited bureaucratic hurdles that slowed down the buyout approval process. 'There are too many hands in the pot as it is because it is government.' The long duration and lack of adequate appropriate communication from federal and state level entities from the time of application submission to the approval process creates temporal uncertainties for local public officials and buyout participants who do not know how long it will take for their buyout application to be approved. Participants mentioned that ENC communities are still waiting years after Hurricane Florence to identify approved applicants. One participant explained that 'We are waiting. Who is going to get bought out? Who is approved? And nobody is communicating with anybody, and it is just the next thing you know, it is another year, and nothing is started yet.' Another stated:

Two weeks ago, for 20-something applicants to go through the file. They were on the approved list. There was one person that was not on the approved list that we have pending right now. But that is the first thing we have heard, and we have been calling and calling, and it is like, nothing; do not even get a return call or anything. And then all of a sudden, they send this generic email, 'Here is your approved list. You have one client that was not approved. However, we are still reviewing it, and they may be approved.'

The uncertainty extends to economic aspects as buyout participants undergo financial hardship and lack of information about funding availability while waiting for a buyout. The economic uncertainties often combine with a lack of housing security during the buyout process when buyout participants live in damaged deteriorating homes, or temporary accommodation, or other housing arrangements for an unspecified duration while waiting for a buyout, creating an additional layer of uncertainty. As one focus group interview participant noted:

But I have heard a lot of comments from property owners that the timeframe is just very long and lengthy and stressful. If you have a flooded home and you are waiting three to four however many years, that is a long time not to have a home and have a resolution for something so stressful in your life.

Binder et al. (2018) have found that residents whose homes are uninhabitable after a disaster event may seek out a variety of emergency housing options, which can be costly financially and socially. Not surprisingly, according to a participant, 'the reason people do not follow through with the buyout is because they either get tired or dead on waiting.' Another participant elaborated that buyout participants are unsure how relocation decisions will impact them economically and socially: 'I might give you the real property value of that flooded property, but what about my job? Where my kids go to school? Where do I go to the dentist? Where do I live next?'

### *Perceived health and economic impacts in ENC communities*

Though not based on systematic documentation, the perspectives of public officials on the impacts in ENC communities were obtained from conversations with impacted community members and observation of their living conditions. According to ENC officials, the

layers of uncertainties are perceived to have health and economic impacts for participating households, compounding the effects of CCWEs on communities in rural coastal ENC. Some homeowners passed away in the process of waiting for a buyout. A participant said, 'We had that in Matthew, people actually passed away in the five years of being impacted and getting assistance.' Similarly, another participant shared, 'we have got several on our Florence buyout list that has passed away in the four years that they have been waiting to be bought out.'

Property owners often stayed in their damaged properties while expecting to be bought out even as those properties deteriorated further, creating health hazards. Living in deteriorating properties has increased exposure to mould, with 'walls that are coming apart, you can see outside, floors falling in, roof caving in, mold everywhere.' Another participant elaborated:

the truth is the impact is very large, especially with the slowness of federal and state response and people out; you have got people from Matt[hew] who [are] still in moldy homes, people from Florence who were about four years out, still in moldy homes. So, and they are breathing that every day, and even though trying to clean it, it is still in the wall. It is still in the floor, so it impacts cognitive [health].

Participants identified specific physical and mental health impacts as most likely a result of living in a mouldy property noting that 'we have people who are starting to have dizziness and blurred vision from mold.' Another stated that the uncertainty and stress while waiting for a buyout can trigger or exacerbate prevailing mental health challenges. 'That weighs a lot on the mental side when we were talking. They were very frustrated; they did not know what to do because they were waiting so long.' Another explained that 'These folks, [...] are still living in moldy homes, [...] the health part of it I am at the kitchen table and getting those phone calls, and people are still breaking down [mentally].'

On the economic side, the buyout programme does not account for expenses that a property owner might incur while waiting for buyout funds even after their application is approved. As one participant explained, 'when we get the funding, it's probably at least a year or more before it would be disbursed, anyway.' As a result, some homeowners have been caught up paying two mortgages simultaneously as they wait for their buyout funds stretching them financially and to the detriment of their credit.

So, a lot of the time, they will go out, and they will buy another house somewhere else, and they are having to pay two mortgages to ruin their credit. I mean, that could be a life changer. So, you have got an economic impact on the family.

Moreover, temporary housing options while waiting for a buyout can be financially draining. Staying in hotels and apartments can be costly, especially when a homeowner must continue to make mortgage payments on the disaster-affected property at the same time. Financial assistance might be available for temporary housing, but the aid often runs out before a buyout occurs. If alternative housing arrangements are unavailable, then a homeowner might have to make the difficult decision to repair and return to their damaged house even if the home will be bought out in the future. Disaster funds spent on repair are deducted from the eventual buyout payment due to policies prohibiting the duplication of benefits (i.e. waste of financial resources), which in turn can lead to economic impacts if the buyout payment is not sufficient to purchase another equivalent property.

### *Streamlining buyouts, improving communication, providing alternatives*

Study participants suggested mitigating the uncertainties in buyout programmes for local administrators and participating households through a multi-pronged approach. First, to simplify and streamline the buyout process, second, to improve communication throughout the buyout cycle, and third, to provide alternative mitigation options for small rural communities.

Focus group interview participants suggested simplifying and streamlining the current buyout system:

[...] It [the process] needs to be simplified and streamlined. If we already have a system in place without having to drop through all the hoops, we could theoretically do this, maybe back in two years again, instead of the four to five. So, it just needs to be already designated to an extent and simplified, so at least try to streamline it.

Our study participants also advocated for a proactive buyout programme that was better prepared with the resources needed to assist eligible impacted homeowners immediately after a disaster to minimise the health and economic impacts attributed to the programme. A participant stated that:

I would say this if they would make some of these mitigation programs in the manner of a block grant. A block grant where here is the money you spend it, and then demonstrate that you met all of these requirements. Because the best time to get somebody to participate in a buyout is when the carpet is still wet, and if they have to hang around for another 18 to 48 months, they are going to fix that, and they are going to remember why they liked living there. They are not going to remember [the hazard risks].

Participants also suggested two ways to mitigate the communication challenges attached to the programme. One, to 'have some type of [an] app where we all can communicate, or everybody gets the same message.' Two, a closer relationship between the impacted homeowners and policymakers. A participant explained that:

Policymakers just need to listen to their communities. We think about communication. We think about educating our communities. We think about all this pushdown. Well, let us stop for a minute and listen to them. What are they going through? What are their concerns? What are their issues?

Finally, participants asked for alternative mitigation options for small rural communities who do not want to exclusively participate in a buyout programme due to concerns about losing their tax base and shrinking their budgets further.

But we then do not have the flexibility to make the adjustments that we need to make or implement changes or new strategies. You have got to start somewhere to make that tax base, but we just simply do not have the funding and the flexibility to implement those. And so, I think the buyout option definitely is an option and may work in some situations, but to have the flexibility with the various funding mechanisms and strategies to look at other options and maybe mix options to meet our community needs would be helpful.

### **Discussion and conclusions**

We conducted focus group interview with planners, emergency managers, elected and other public officials from ENC to learn about their experiences of and challenges using

buyout programmes to mitigate the impacts of CCWEs in ENC. Results from the qualitative analysis of the focus group transcripts indicate that the governance of buyout programmes remains a complex lengthy process lacking adequate communication and leads to uncertainties for local public officials and property owners during the buyout. The layers of uncertainties for local officials and programme participants in turn have perceived health and economic impacts on buyout participants, compounding the effects of CCWEs on communities in rural coastal ENC. Because there is little research on the experiences of local government officials implementing buyout programmes (Binder et al., 2020), the findings presented here from the perspective of local officials especially in rural communities, is a useful addition to the current literature.

Study findings show that property attachment, social ties in the community, and financial considerations drive the decisions to accept or reject offers for residential property owners in rural ENC who are considering a buyout. While these findings confirm previous work (e.g. Fraser et al., 2006; Kick et al., 2011), they also highlight differences with previous scholarship. For instance, the findings of Baker and their research team (2018) show that homeowners in Oakwood Beach accepted buyout offers after Hurricane Sandy because they feared losing access to basic amenities. In ENC, the perspective of local officials suggests that property owners rejected buyouts due to uncertainty associated with a fear of the loss of social community networks. Other considerations such as property attachment and financial issues are consistent with previous research. Fraser et al. (2006) note that longer a homeowner stays on a property, the lower the chances of accepting the buyout offer, irrespective of funds availability. This is in line with our findings in ENC. According to the perspective of local officials, emotional attachment to property plays an important role in rejecting or accepting a buyout offer. Black households, attached to their land and property stemming from historical injustices, might be less likely to join buyout programmes and thus be more vulnerable to future CCWEs, leading to inequitable resilience within rural communities.

Our findings also show that the governance of buyout programmes is characterised by a lengthy process lacking adequate appropriate communication leading to greater uncertainty for local public officials and property owners during the buyout process. Buyout administrators in ENC communities identified bureaucratic hurdles as a key issue as it increases buyout programme duration and complexity, which according to Fraser et al. (2006), can hinder local communities from making site-specific decisions. Our findings show that communication gaps between local level buyout administrators and the state and federal government is another challenge, leading to a longer programme duration. While the long duration of buyout programmes and communication gaps are well documented in the current literature, we add to this scholarship by identifying the uncertainties resulting from buyout programme governance issues. The uncertainties can be temporal (e.g. not knowing how long it will take for the buyout application to be approved), economic (e.g. financial hardships and uncertainty of funding while waiting for the buyout), or related to housing security (e.g. living in damaged, temporary, or other housing arrangements for unspecified duration while waiting for the buyout). Our findings fill gaps mentioned in previous work (Mach et al., 2019) that have noted the slow implementation of buyout projects and asked for further evaluation of its implications for participating communities, property owners, and residents.



Though some of our findings are not specific to rural communities, our study notes the perspective of local officials regarding the health and economic impacts of the buyout process on rural participants in communities that are resource poor, isolated, and have limited access to health infrastructure. This in turn compounds the effects of CCWEs on communities in rural coastal ENC. Furthermore, our findings show that local officials in rural ENC are interested in and recommend a simplified and streamlined buyout programme and improved communication throughout the cycle to mitigate uncertainties in the buyout process. Participants also ask for alternative mitigation options for small rural communities where the loss of the tax base, disruption of community cohesion, attachment to generational properties, and the perceived health and economic impacts on participating households remain significant concerns. This is in line with Marino's (2018) arguments that the assumptions underlying buyout policies disadvantage certain communities, in this case small rural communities, while limiting the inventory of possibilities that they must choose from and reinforcing pre-existing inequities within the rural communities facing CCWEs.

As a place-based study, we are unable to extend our findings to regions beyond ENC and suggest further research on the experiences of local officials and buyout administrators during the peri-buyout phase in other rural areas for more insights into buyout programmes. Moreover, follow-on research conducted by our team and specifically focused on rural, flood-prone, underserved, low-income communities in the Carolinas are currently underway. This extension of our work on buyouts will look at the intended and unintended consequences of buyout programmes as an adaptive response to CCWEs and aims to capture the benefits and costs of this adaptation strategy while addressing the fiscal and equity challenges.

Binder and Greer (2016) have observed that buyout programmes are designed and implemented independently by local agencies lacking in buyout experience, with limited learning from past programmes, and without much guidance from federal funding agencies. Our recommendations above are relevant to buyout implementation in rural coastal communities. If incorporated, the suggestions can guide policymakers, looking to restructure future buyout programmes based on learning from prior experiences, to design accessible and more inclusive buyout programmes.

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## References

- Ahmadiani, M., Ferreira, S., & Landry, C. E. (2019). Flood insurance and risk reduction: Market penetration, coverage, and mitigation in coastal North Carolina. *Southern Economic Journal*, 85(4), 1058–1082. <https://doi.org/10.1002/soej.12332>
- Atoba, K. O., Brody, S. D., Highfield, W. E., Shepard, C. C., & Verdone, L. N. (2021). Strategic property buyouts to enhance flood resilience: A multi-criteria spatial approach for incorporating ecological values into the selection process. *Environmental Hazards*, 20(3), 229–247. <https://doi.org/10.1080/17477891.2020.1771251>
- Baker, C. K., Binder, S. B., Greer, A., Weir, P., & Gates, K. (2018). Integrating community concerns and recommendations into home buyout and relocation policy. *Risk, Hazards & Crisis in Public Policy*, 9(4), 445–479. <https://doi.org/10.1002/rhc3.12144>
- BenDor, T. K., Salvesen, D., Kamrath, C., & Ganzer, B. (2020). Floodplain buyouts and municipal finance. *Natural Hazards Review*, 21(3), 04020020. [https://doi.org/10.1061/\(ASCE\)NH.1527-6996.0000380](https://doi.org/10.1061/(ASCE)NH.1527-6996.0000380)
- Bin, O., & Polasky, S. (2004). Effects of flood hazards on property values: Evidence before and after Hurricane Floyd. *Land Economics*, 80(4), 490. <https://doi.org/10.2307/3655805>
- Binder, S. B., Baker, C. K., & Barile, J. P. (2015). Rebuild or relocate? Resilience and post disaster decision-making after Hurricane Sandy. *American Journal of Community Psychology*, 56(1–2), 180–196. <https://doi.org/10.1007/s10464-015-9727-x>
- Binder, S. B., Barile, J. P., Baker, C. K., & Kulp, B. (2019). Home buyouts and household recovery: Neighborhood differences three years after Hurricane Sandy. *Environmental Hazards*, 18(2), 127–145. <https://doi.org/10.1080/17477891.2018.1511404>
- Binder, S. B., & Greer, A. (2016). The devil is in the details: Linking home buyout policy, practice, and experience after Hurricane Sandy. *Politics and Governance*, 4(4), 97–106. <https://doi.org/10.17645/pag.v4i4.738>
- Binder, S. B., Greer, A., & Baker, C. (2018). *Home buyouts programs: Recommendations for policy and practice*. Home Buyout Policy Brief.
- Binder, S. B., Greer, A., & Zavar, E. (2020). Home buyouts: A tool for mitigation or recovery? *Disaster Prevention and Management: An International Journal*, 29(4), 497–510. <https://doi.org/10.1108/DPM-09-2019-0298>
- Calil, J., Beck, M. W., Gleason, M., Merrifield, M., Klausmeyer, K., & Newkirk, S. (2015). Aligning natural resource conservation and flood hazard mitigation in California. *PLoS One*, 10(7), e0132651. <https://doi.org/10.1371/journal.pone.0132651>
- Cheng, S., Ganapati, E., & Ganapati, S. (2015). Measuring disaster recovery: Bouncing back or reaching the counterfactual state? *Disasters*, 39(3), 427–446. <https://doi.org/10.1111/disa.12112>
- Cigler, B. A. (2017). U.S. floods: The necessity of mitigation. *State and Local Government Review*, 49(2), 127–139. <https://doi.org/10.1177/0160323X17731890>
- Conrad, D. R., McNitt, B., & Stout, M. (1998). *Higher ground: A report on voluntary property buyouts in the nation's floodplains, a common ground solution serving people at risk, taxpayers, and the environment*. National Wildlife Federation.
- Consoer, M., & Milman, A. (2018). Opportunities, constraints, and choices for flood mitigation in rural areas: Perspectives of municipalities in Massachusetts. *Journal of Flood Risk Management*, 11(2), 141–151. <https://doi.org/10.1111/jfr3.12302>
- Correll, R. M., Lam, N. S. N., Mihunov, V. V., Zou, L., & Cai, H. (2021). Economics over risk: Flooding is not the only driving factor of migration considerations on a vulnerable coast. *Annals of the American Association of Geographers*, 111(1), 300–315. <http://doi.org/10.1080/24694452.2020.1766409>
- Creswell, J. W. (2007). *Qualitative inquiry & research design*. Sage Publications.
- Curtis, S., Mukherji, A., Kruse, J., Helgeson, J., Ghosh, A., & Adeniji, N. (2022). Perceptions of risk to compound coastal water events: A case study in eastern North Carolina, USA. *Progress in Disaster Science*, 16, Article 100266. <https://doi.org/10.1016/j.pdisas.2022.100266>
- Cutter, S. L., Ash, K. D., & Emrich, C. T. (2016). Urban-rural differences in disaster resilience. *Annals of the American Association of Geographers*, 106(6), 1236–1252. <https://doi.org/10.1080/24694452.2016.1194740>

- Dannenberg, A. L., Frumkin, H., Hess, J. J., & Ebi, K. L. (2019). Managed retreat as a strategy for climate change adaptation in small communities: Public health implications. *Climatic Change*, 153(1–2), 1–14. <https://doi.org/10.1007/s10584-019-02382-0>
- De Polt, K. (2021). *Analyzing drivers of compound coastal water events (CCWE) with copulas: A case study in eastern North Carolina* [MS thesis, East Carolina University]. 98 pp. <https://thescholarship.ecu.edu/handle/10342/9730>
- de Vries, D. H., & Fraser, J. C. (2012). Citizenship rights and voluntary decision making in post-disaster U.S. floodplain buyout mitigation programs. *International Journal of Mass Emergencies and Disasters*, 30(1), 1–33. <https://doi.org/10.1177/028072701203000101>
- Elliott, J. R., Brown, P. L., & Loughran, K. (2020). Racial inequities in the federal buyout of flood-prone homes: A nationwide assessment of environmental adaptation. *Socius*, 6, 1–15. <https://doi.org/10.1177/2378023120905439>
- FEMA. (1998). *Property acquisition handbook for local communities*. Federal Emergency Management Agency.
- FEMA. (2015). *Hazard mitigation grant program*. Retrieved March 10, 2023, from <http://www.fema.gov/hazard-mitigationgrant-program>
- FEMA: Acquisition of property after a flood event. (2018). FEMA.gov. Retrieved March 10, 2023, from <https://www.fema.gov/news-release/20200220/fey-enfomasyon-akizisyon-pwopriyete-apre-yon-inondasyon>
- Fothergill, A., & Peek, L. A. (2012). Permanent temporariness: Displaced children in Louisiana. In L. Weber & L. Peek (Eds.), *Displaced: Life in the Katrina diaspora* (pp. 119–143). University of Texas Press.
- Fraser, J., Elmore, R., Rohe, W., & Godshalk, D. (2003). *Implementing floodplain land acquisition programs in urban localities*. Federal Emergency Management Agency.
- Fraser, J. C., Doyle, W. M., & Young, H. (2006). Creating effective flood mitigation policies. *Eos, Transactions American Geophysical Union*, 87(27), 265–270. <https://doi.org/10.1029/2006EO270002>
- Godschalk, D. R., Beatley, T., Berke, P., Brower, D. J., & Kaiser, E. J. (1999). *Natural hazard mitigation: Recasting disaster policy and planning*. Island Press.
- Gori, A., Lin, N., & Smith, J. (2020). Assessing compound flooding from landfalling tropical cyclones on the North Carolina coast. *Water Resources Research*, 56(4), e2019WR026788. <https://doi.org/10.1029/2019wr026788>
- Greer, A., & Binder, S. B. (2017). A historical assessment of home buyout policy: Are we learning or just failing? *Housing Policy Debate*, 27(3), 372–392. <https://doi.org/10.1080/10511482.2016.1245209>
- Hauer, M. E., Evans, J. P., & Mishra, D. (2016). Millions projected to be at risk from sea-level rise in the continental United States. *Nature Climate Change*, 6(7), 691–695. <https://doi.org/10.1038/nclimate2961>
- Hori, M., & Schafer, M. J. (2009). Social costs of displacement in Louisiana after hurricanes Katrina and Rita. *Population and Environment*, 31(1/3), 64–86. <https://doi.org/10.1007/s11111-009-0094-0>
- Horney, J., Simon, M., Grabich, S., & Berke, P. (2014). Measuring participation by socially vulnerable groups in hazard mitigation planning, Bertie County, North Carolina. *Journal of Environmental Planning and Management*, 58(5), 802–818. <https://doi.org/10.1080/09640568.2014.892870>
- Jerolleman, A. (2020). Challenges of post-disaster recovery in rural areas. In S. Laska (Ed.), *Louisiana's response to extreme weather* (pp. 285–310). Springer. [https://doi.org/10.1007/978-3-030-27205-0\\_11](https://doi.org/10.1007/978-3-030-27205-0_11)
- Kick, E. L., Fraser, J. C., Fulkerson, G. M., McKinney, L. A., & De Vries, D. H. (2011). Repetitive flood victims and acceptance of FEMA mitigation offer: An analysis with the community–system policy implications. *Disasters*, 35(3), 510–539. <https://doi.org/10.1111/j.1467-7717.2011.01226.x>
- King, D., Bird, D., Haynes, K., Boon, H., Cottrell, A., Millerr, H., Okada, T., Box, P., Keogh, D., & Thomas, M. (2014). Voluntary relocation as an adaptation strategy to extreme weather events. *International Journal of Disaster Risk Reduction*, 8, 83–90. <https://doi.org/10.1016/j.ijdrr.2014.02.006>
- Knobloch, D. M. (2005). Moving a community in the aftermath of the great 1993 midwest flood. *Journal of Contemporary Water Research & Education*, 130(1), 41–45. <https://doi.org/10.1111/j.1936-704X.2005.mp130001008.x>

- Kuru, O. D., Ganapati, N. E., & Marr, M. (2022). Perceptions of local leaders regarding postdisaster relocation of residents in the face of rising seas. *Housing Policy Debate*, 33(5), 1124–1145. <https://doi.org/10.1080/10511482.2022.2077800>
- Lal, P., Alavalapati, J. R., & Mercer, E. D. (2011). Socio-economic impacts of climate change on rural United States. *Mitigation Adaptation Strategy Global Change*, 16(7), 819–844. <https://doi.org/10.1007/s11027-011-9295-9>
- Landry, C. E., & Li, J. (2012). Participation in the community rating system of NFIP: Empirical analysis of North Carolina counties. *Natural Hazards Review*, 13(3), 205–220. [https://doi.org/10.1061/\(ASCE\)NH.1527-6996.0000073](https://doi.org/10.1061/(ASCE)NH.1527-6996.0000073)
- Lincke, D., & Hinkel, J. (2018). Economically robust protection against 21st century sea-level rise. *Global Environmental Change*, 51, 67–73. <https://doi.org/10.1016/j.gloenvcha.2018.05.003>
- Mach, K. J., Kraan, C. M., Hino, M., Siders, A. R., Johnston, E. M., & Field, C. B. (2019). Managed retreat through voluntary buyouts of flood-prone properties. *Science Advances*, 5(10), eaax899. <https://doi.org/10.1126/sciadv.aax8995>
- Mach, K. J., & Siders, A. R. (2021). Reframing strategic managed retreat for transformative climate adaptation. *Science*, 372(6548), 1294–1299. <https://doi.org/10.1126/science.abh1894>. <https://www.science.org>
- Maly, E., & Ishikawa, E. (2013). Land acquisition and buyouts as disaster mitigation after Hurricane Sandy in the United States. In *Proceedings of International Symposium on City Planning* (pp. 1–18).
- Marino, E. (2018). Adaptation privilege and voluntary buyouts: Perspectives on ethnocentrism in sea level rise relocation and retreat policies in the US. *Global Environmental Change*, 49, 10–13. <https://doi.org/10.1016/j.gloenvcha.2018.01.002>
- McGhee, D. J., Binder, S. B., & Albright, E. A. (2020). First, do no harm: Evaluating the vulnerability reduction of post-disaster home buyout programs. *Natural Hazards Review*, 21(1), 05019002. [https://doi.org/10.1061/\(ASCE\)NH.1527-6996.0000337](https://doi.org/10.1061/(ASCE)NH.1527-6996.0000337)
- Miles, M. B., & Huberman, A. M. (1994). *An expanded sourcebook: Qualitative data analysis*. Sage Publications.
- Miller, R. (2013). More than “not urban”: Seeking a quantifiable definition of rural. *Berkeley Planning Journal*, 26(1), 39–62. <https://doi.org/10.5070/BP326117853>
- Mortensen, K., Rick, K. W., & Vivian, H. (2009). Physical and mental health status of Hurricane Katrina evacuees in Houston in 2005 and 2006. *Journal of Health Care for the Poor and Underserved*, 20(2), 524–538. <https://doi.org/10.1353/hpu.0.0130>
- Mukherji, A., Curtis, S., Helgeson, J., Kruse, J. K., & Ghosh, A. (2023). Mitigating compound coastal water hazards in eastern North Carolina. *Journal of Environmental Planning and Management*. <https://doi.org/10.1080/09640568.2023.2183112>
- Musser, J. W., Watson, K. M., & Gotvald, A. J. (2017). *Characterization of peak streamflows and flood inundation at selected areas in North Carolina following Hurricane Matthew, October 2016*. Open-File Report. <https://doi.org/10.3133/ofr20171047>
- Nelson, K. S., & Molloy, M. (2021). Differential disadvantages in the distribution of federal aid across three decades of voluntary buyouts in the United States. *Global Environmental Change*, 68, Article 102278. <https://doi.org/10.1016/j.gloenvcha.2021.102278>
- NOAA's National Weather Service. (2018). *Hurricane Florence: September 14, 2018*. Retrieved March 16, 2023, from <https://www.weather.gov/ilm/HurricaneFlorence>
- NPR Cookie Consent and Choices. (2019). NPR. Retrieved May 30, 2022, from. <https://choice.npr.org/index.html?origin=https://www.npr.org/2019/03/05/696995788/search-the-thousands-of-disaster-buyouts-fema-didnt-want-you-to-see>
- Perry, R. W., & Lindell, M. K. (1997). Principles for managing community relocation as a hazard mitigation measure. *Journal of Contingencies and Crisis Management*, 5(1), 49–59. <https://doi.org/10.1111/1468-5973.00036>
- Peterson, K., Apadula, E., Salvesen, D., Hino, M., Kihlslinger, R., & BenDor, T. K. (2020). A review of funding mechanisms for us floodplain buyouts. *Sustainability*, 12(23), 10112. <https://doi.org/10.3390/su122310112>
- Robinson, C. S., Davidson, R. A., Trainor, J. E., Kruse, J. L., & Nozick, L. K. (2018). Homeowner acceptance of voluntary property acquisition offers. *International Journal of Disaster Risk Reduction*, 31,

- 234–242. <https://doi.org/10.1016/j.ijdr.2018.05.002>. <https://www.sciencedirect.com/science/article/pii/S2212420918302589>
- Saldaña, J. (2009). *The coding manual for qualitative researchers* (4th ed.). Sage Publications.
- Schwaller, N. L., & BenDor, T. K. (2021). Differential residential perspectives on in situ protection and retreat as strategies for climate adaptation. *Climatic Change*, 167(3–4), 387. <http://doi.org/10.1007/s10584-021-03055-7>
- Siders, A. R. (2019). Managed retreat in the United States. *One Earth*, 1(2), 216–225. <https://doi.org/10.1016/j.oneear.2019.09.008>
- Siders, A. R., Ajibade, I., & Casagrande, D. (2021). Transformative potential of managed retreat as climate adaptation. *Current Opinion in Environmental Sustainability*, 50, 272–280. <https://doi.org/10.1016/j.cosust.2021.06.007>
- Slavíková, L., Hartman, T., & Thaler, T. (2021). Paradoxes of financial schemes for resilient flood recovery of households. *WIREs Water*, 8(2), e1497. <https://doi.org/10.1002/wat2.1497>
- Sou, G., Shaw, D., & Aponte-Gonzalez, F. (2021). A multidimensional framework for disaster recovery: Longitudinal qualitative evidence from Puerto Rican households. *World Development*, 144, Article 105489. <https://doi.org/10.1016/j.worlddev.2021.105489>
- Spialek, M. L., Houston, J. B., & Worley, K. C. (2019). Disaster communication, posttraumatic stress, and posttraumatic growth following Hurricane Matthew. *Journal of Health Communication*, 24(1), 65–74. <https://doi.org/10.1080/10810730.2019.1574319>
- Tate, E., Strong, A., Kraus, T., & Xiong, H. (2016). Flood recovery and property acquisition in Cedar Rapids, Iowa. *Natural Hazards*, 80(3), 2055–2079. <https://doi.org/10.1007/s11069-015-2060-8>
- Thaler, T. (2021). Just retreat-how different countries deal with it: Examples from Austria and England. *Journal of Environmental Studies and Sciences*, 11(3), 412–419. <https://doi.org/10.1007/s13412-021-00694-1/Published>
- Thaler, T., & Fuchs, S. (2019). Financial recovery schemes in Austria: How planned relocation is used as an answer to future flood events. *Environmental Hazards*, 19(3), 268–284. <https://doi.org/10.1080/17477891.2019.1665982>
- US Census Bureau. (n.d.). Rural America: How does the U.S. Census Bureau define “rural?” Interactive story map. <https://www.census.gov/programs-surveys/geography/guidance/geo-areas/urban-rural.html>
- Waugh, W. L. (2013). Management capacity and rural community resilience. In N. Kapucu, C. V. Hawkins, & F. I. Rivera (Eds.), *Disaster resiliency: Interdisciplinary perspectives*. Routledge.
- WRAL. (2009). Hurricane Floyd: The storm, the aftermath. *WRAL.com*. Retrieved March 16, 2023, from [https://www.wral.com/news/local/asset\\_gallery/5225107/](https://www.wral.com/news/local/asset_gallery/5225107/)
- Zavar, E., & Hagelman, R. R. (2016). Land use change on U.S. floodplain buyout sites, 1990–2000. *Disaster Prevention and Management*, 25(3), 360–374. <https://doi.org/10.1108/DPM-01-2016-0021>