

Social justice implications of U.S. managed retreat buyout programs

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Abstract

Global climate change poses significant risks to coastal and riverine communities. Managed retreat, the purposeful movement of people and infrastructure out of vulnerable floodplains, is one possible adaptation strategy. The United States has already engaged in a limited amount of retreat by providing federal funds to purchase and demolish or relocate vulnerable properties. As retreat programs are expected to expand in size and frequency to address the increased risks posed by climate change, a review of how such property acquisition programs have been implemented is timely. Specifically, decisions made by government officials regarding where to acquire properties have significant potential social justice implications, as buyouts could promote or reduce existing social inequities, but it is unclear how such decisions are being made. A review of eight U.S. buyout programs suggests that buyouts, as practiced, lack transparency, which may increase public distrust of the process and reduce participation. Moreover, decisions often involve political motivations and rely on cost-benefit logic that may promote disproportionate retreat in low-income or minority communities, continuing historic patterns of social inequity. However, as low-income communities in the United States also tend to be highly vulnerable to climate-exacerbated hazards, a decision not to relocate may also promote disproportionate harm. The buyout programs reviewed provide examples of how to mitigate these concerns through increased transparency, emphasis on relocation, explicit focus on social inequality, longer-term and larger-scale holistic approaches, and participatory pre-disaster planning. Further research on past programs is needed to evaluate outcomes and processes to improve future adaptation efforts.

Keywords

adaptation; disaster risk reduction; flood; managed retreat; relocation; social justice

1. Introduction

The effects of global climate change will not be equally distributed (IPCC 2013) and nor will our adaptation response (Thomas and Twyman 2005; Paavola and Adger 2006). Limited resources will, and already do, require decisions to be made about where and how to adapt. Understanding how such decisions are being made, and developing a robust, socially just method for deciding in the future, is a critical effort for adaptation research.

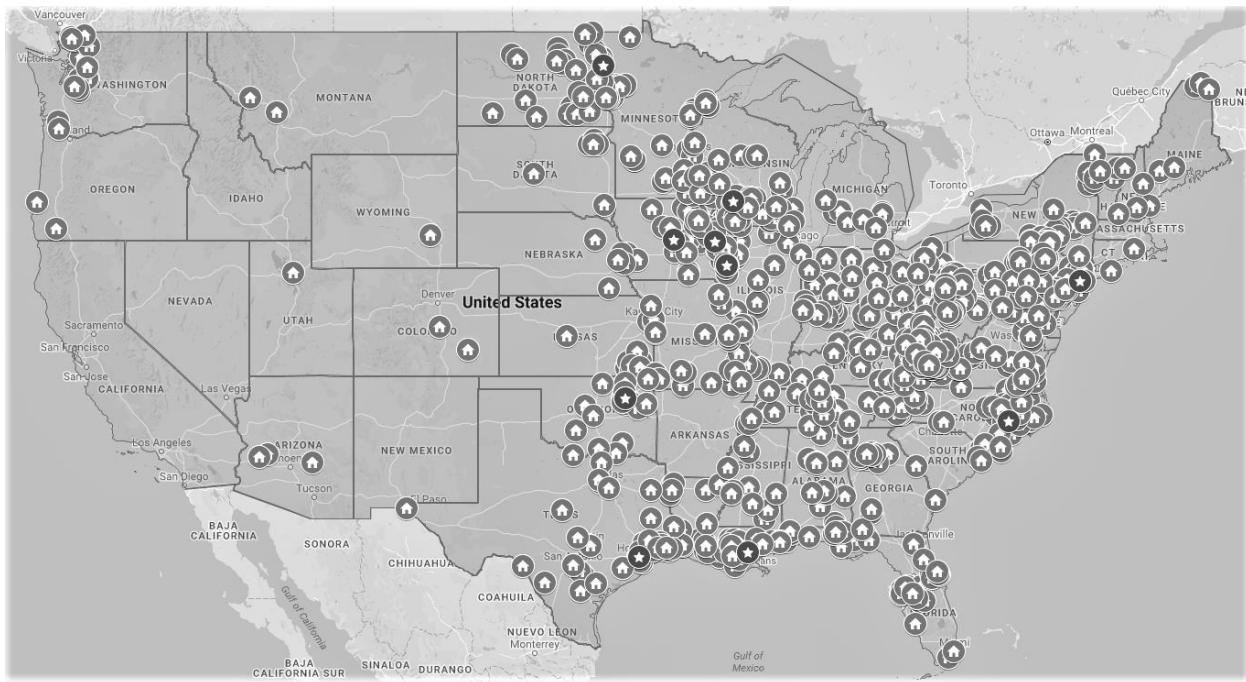
Global climate change is altering rain and storm patterns and raising sea levels: hazards projected to place millions of people and billions of dollars of infrastructure at risk in the United States alone (Hallegatte et al. 2013; Hauer et al. 2016). U.S. coasts are home to some of the nation's wealthiest and poorest people (Sarmiento and Miller 2006; SAMHSA 2017), and decisions about where to invest adaptation resources, about which communities to protect and how, have social justice implications. The U.S. communities most vulnerable to natural hazards tend to be low-income or minority (Mileti 1999; Kates et al. 2006; Freudenberg et al. 2016). This is due not only to historic housing prices, with riskier areas being more affordable (see, e.g., Campanella 2002), or purposeful displacement or relocation (see, e.g., Mahler 2012), but also to a history of government decisions that prioritized hazard protection in areas more often populated by wealthy, non-minority residents. For example, in a study of U.S. flood defense protection patterns, Martinich et al. (2013) found 99% of the most socially vulnerable people in the Gulf Coast live in areas unlikely to be protected from inundation by government programs, compared to just 8% of the least socially vulnerable.

Environmental justice research has a rich history of exploring the effects of government policies on vulnerable populations, but these lessons have not yet transferred into the climate adaptation literature, which has focused primarily on distributive justice among nations (e.g., Paavola & Adger, 2006) or inequitable exposure to climate effects (e.g., Thomas & Twyman, 2005), rather than the potential effect of adaptation policies themselves. This paper begins to address that gap by examining the potential social justice implications of decision-making practices in U.S. managed retreat programs.

U.S. flood management has historically relied on protection and accommodation to mitigate flood risk (IPCC 2013), but the United States also has a long (if small-scale) history of engaging in managed retreat, the policy of removing infrastructure from vulnerable areas to reduce future risk (Neal et al. 2005). U.S. retreat efforts date back at least to 1978, when the town of Soldiers Grove, Wisconsin, relocated away from the flood-prone Kickapoo River, and retreat programs increased significantly following the Great Midwest Floods of 1993, when Congress expanded federal authority to promote retreat through property acquisition. Although retreat may be accomplished through a variety of legal and policy tools (Kim and Karp 2012; Siders 2013a), U.S. officials most often use voluntary property acquisition: a program in which government purchases homes at risk of flooding and the owners

relocate (Dyckman et al. 2014). Since 2000 the Federal Emergency Management Agency (FEMA) has spent over \$843 million to fund voluntary property acquisition programs in more than 1,100 communities in 44 states (FEMA 2017) (Figure 1). In light of repeated disasters and rising costs of protecting communities in the floodplain, retreat through voluntary relocation is expected to play an even larger role in future floodplain adaptation (Fraser et al. 2003; Kousky 2014).

Figure 1. FEMA HMGP-funded property acquisition programs are mapped to illustrate the scope of property acquisition as a floodplain response. Although this study considers programs funded by FEMA, HUD, and other sources, only HMGP buyout locations were publicly available. Dark circles signify programs reviewed in this study.



Retreat is intended to reduce the cost of future emergency response and disaster recovery efforts and reduce burden on the National Flood Insurance Program by decreasing the number of at-risk policies (FEMA 2017). However, managed retreat also has the potential to cause social, economic, and psychological harm through loss of community, local tax revenue, and sense of place (Binder et al. 2015). Research has shown elderly populations and minority communities are particularly vulnerable when relocated away from social support systems (see de Vries and Fraser 2012; Muñoz and Tate 2016).

Yet, despite potential harms and widespread use, there is little academic work on property acquisition (Dyckman et al. 2014; Kousky 2014; Greer and Binder 2016), and even less that is practice-

relevant (Greer and Binder 2017). A growing body of research explores the factors that drive individual homeowners to accept or reject acquisition offers (Fraser et al. 2006a, b; Kates et al. 2006; Kick et al. 2011; de Vries and Fraser 2012; Binder et al. 2015; Binder and Greer 2016; Bukvic and Owen 2016) but very little work has explored how government officials decide where to make those offers (see Menoni and Pesaro 2008; Dyckman et al. 2014). As with the siting of flood protection measures (Martinich et al. 2013), government decisions about where to engage in retreat play an important role in shaping the social composition of floodplain communities. Following a major disaster, a community is likely to have hundreds or thousands of damaged homes, but most managed retreat programs acquire only a handful or dozen of properties. This begs the question: Why these properties? Why not neighboring homes or blocks? This paper explores how government officials have made decisions about where to retreat, about which homes to offer to purchase through voluntary property acquisition programs, and the social justice implications of such decision-making processes and criteria.

1.1. A note on buyout logistics

U.S. floodplain property acquisition programs are commonly funded by the federal government and administered by the state or local government. The state or local government is therefore responsible for deciding which properties to acquire, but federal funding restrictions inform these decisions. FEMA, through its Hazard Mitigation Grant Program (HMGP), and the Department of Housing and Urban Development (HUD) through its Community Development Block Grants (CDBG) and CDBG-Disaster Recovery (CDBG-DR), are the primary sources of federal funding for floodplain property acquisition. Some of the distinctions among these funding sources, along with their implications for program design, are outlined in Table 1.

In most cases, communities engage in floodplain acquisition after a major disaster, as this is when HMGP and CDBG-DR funding become available and political support is at its highest (see de Vries and Fraser 2012). State or local governments apply for federal funding, and the relevant federal agencies review applications to ensure they meet eligibility criteria. To be eligible for FEMA funding, the project must be environmentally sound, cost-effective, and reduce future risk (FEMA 2007). Cost-effectiveness is determined by a FEMA-approved cost-benefit analysis (CBA) process, although expedited processes and pre-calculated benefits are available for acquisition of substantially damaged homes in floodplains (FEMA 2015). For HUD, the project must benefit low- or moderate-income (LMI) households, eradicate slums or blights, or address an urgent public safety need (HUD 2017). A typical CDBG project is required to use 70% of the funds to benefit LMI households, but this requirement can be reduced or waived (historically as low as 15%, Boyd 2011), and most post-disaster acquisition funding is expended under the urgent need category with reduced LMI requirements (Boyd 2011; Gotham 2014; GOSR 2015).

Table 1. Sources of and restrictions on federal funding for floodplain acquisition.

Source	Type	Federal Contribution	Post-Acquisition Deed Restrictions	Other Restrictions	Legal Authority	Purchase Price	
FEMA	HMGP	Voluntary	75% of project cost; other 25% from non-FEMA sources	acquired properties deed-restricted for open space, recreational, or wetlands management in perpetuity; properties may not be sold or transferred to private ownership		Robert T. Stafford Disaster Relief and Emergency Assistance Act; National Flood Insurance Act; CFR 44 Part 80, Property Acquisition and Relocation for Open Space	Pre-disaster fair market value (FMV) (possible incentive or relocation bonuses)
	CDBG	Voluntary or Non-voluntary	25% match paired with FEMA as cost-share or up to 100% independent	no deed restrictions; redevelopment possible	70% of CDBG funds expended must benefit low to moderate income persons (LMI)	Housing and Community Development Act (HCDA); Uniform Relocation Assistance and Real Property Acquisition Policies Act (URA)	Pre- or post-disaster FMV (possible incentive or relocation bonus)
HUD	CDBG-DR	Voluntary	25% match paired with FEMA as cost-share or up to 100% independent	· within 100-year floodplain: deed-restricted to remain undeveloped; may be sold or transferred to private owner with deed restrictions; · outside 100-year floodplain: no deed-restriction required; redevelopment possible	Appropriation may reduce or waive LMI requirements	Disaster Relief Appropriations Act (Specific to each disaster: allows HUD to waive HCDA provisions and add alternatives to tailor to specific disaster recovery needs)	Pre- or post-disaster FMV (possible incentive or relocation bonus)

Once an application is approved, the administering agency negotiates purchase offers with individual homeowners.¹ Offers are based on the pre- or post-disaster fair market value (FMV) of the home as determined by a licensed appraiser. HMGP requires programs to offer pre-disaster FMV, while CDBG may allow the program to use either pre- or post-disaster FMV. Offering post-disaster FMV reduces programmatic costs but may also reduce participation rates. Programs may offer additional payments to incentivize participation, aid relocation, or encourage relocation in a specific area (e.g., GOSR 2015). The entire process may take 18-36 months (Fraser et al. 2003; Siders 2013a).

Homes acquired using HMGP funds or CDBG-DR funds and located within the 100-year floodplain must be demolished and the property maintained as open space in perpetuity. CDBG-DR may allow redevelopment outside the 100-year floodplain, but this depends on the particular appropriation bill that authorized those funds. Regular CDBG funds have no such restrictions and may be used to acquire and sell or redevelop properties (see Table 1). It is common for communities to use a mix of funding sources. Cedar Rapids, Iowa; Grand Forks, North Dakota; and New York State, for example, all used HMGP funding to acquire damaged properties in the floodplain and CDBG funding to acquire properties elsewhere that could be redeveloped to replace housing stock and revitalize the community (Rakow et al. 2003; Rakow 2005; Tate et al. 2016). Communities also often mix funding sources because HMGP provides 75% of program costs, and local or state governments may use CDBG funds to cover their 25% share.

Some programs distinguish the specific type of acquisition in which land is maintained as open space by designating it a *buyout* (Siders 2013b; GOSR 2015). As buyouts have the potential to reduce local property tax revenue, they have a distinct economic concern, but buyouts also offer greatest protection from future floods and climate change. This study therefore focuses on government decisions surrounding buyouts, even in locations where properties were acquired both for redevelopment and open space.

All HMGP and CDBG-DR acquisitions are voluntary (FEMA 2007). Homeowners may choose whether or not to accept a purchase offer, and state and local officials may not use or threaten to use their eminent domain or condemnation powers. CDBG funds may be used for non-voluntary acquisition, but these actions fall under a different set of legal authorities and are exceedingly rare in floodplain retreat, so this study focuses solely on voluntary acquisitions. However, as de Vries and Fraser (2012) have noted, voluntary programs may still be coercive in practice, especially when engaging vulnerable populations.

¹ Rental properties and tenant rights in buyouts are another source of social justice concerns but are beyond the scope of this article.

2. Methods

This study explored social justice issues in government decision criteria in U.S. floodplain acquisition programs by conducting a systematic literature review and analyzing the implementation of eight property acquisition programs in U.S. coastal and riverine floodplains: Staten Island, NY; Cedar Rapids, IA; Grand Forks, ND; Kinston, NC; Wapello, IA; Harris County, TX; Tulsa, OK; and Soldiers Grove, WI (see Figure 1 for geographic locations and Table 2 for details). The cases represent a variety of geographic locations, city sizes, demographic profiles, and time periods, but they are not representative of U.S. buyout programs, as they are unusually large, involving the acquisition of hundreds of properties or relocation of whole communities. However, their large nature may make them representative of future buyout programs if the United States continues to pursue managed retreat as a strategy for adaptation to climate change. Moreover, these are the only U.S. buyout programs with sufficiently well-documented government decision criteria to enable review: that is, their implementation has been described in more than one publicly available government report or academic study.

Eighty-two academic texts on managed retreat and floodplain acquisition, identified through a systematic literature review, were coded to identify decision processes and social justice issues. Documents about each case – including academic studies, government reports, testimonials, and newspaper articles – were reviewed and coded to identify decision-making criteria and processes used by officials to decide which homes to offer to purchase. A methods appendix provides more details on the literature review, selection of cases, and case analysis.

Table 2. Contextual information on U.S. floodplain property acquisition programs reviewed. Connections to the literature list a non-comprehensive selection of government and academic papers. Greer and Binder (2017) analyze these and other cases to assess the ability of U.S. buyout programs to learn over time.

Location	Disaster	Buyout Description	Number of Properties	Buyout Decision Level	Funding Sources	Literature Sources
Staten Island, New York	Hurricane Sandy, 2012; Hurricane Irene, 2011	2013-Present: New York State offered a buyout program in three Staten Island neighborhoods (299 homes); New York City offered an acquisition and redevelopment program (132 homes)	431 (through Oct 2016)	State & city compromise	HUD CDBG; FEMA HMGP; State	Build It Back Report Oct 2016; Binder 2015; Brady 2015; Maly 2013
Cedar Rapids, Iowa	Cedar River flood, 2008	2008-2014: Acquired homes river-side of new defense construction and for neighborhood revitalization; Creating a 110-acre greenway along the river	1356	City	HUD CDBG; FEMA HMGP; State; City	Tate et al. 2016; Munoz & Tate 2016; Smith 2014
Grand Forks, North Dakota	Red River flood, 1997	1997-1999: Purchased 802 homes river-side of new dike construction; Created 2,200-acre riverfront park; Prioritized development in less risky areas	802	City	HUD CDBG; FEMA HMGP; State	Kweit 2007; deVries 2012; Shelby 2008; Fothergill 2004; Fraser 2003
Kinston, North Carolina	Hurricane Fran, 1996; Hurricane Floyd, 1999	1996-2001: Removed almost all buildings in 100-year floodplain (97% participation rate); Majority of participants low-income minorities	775	City	FEMA HMGP; State; Clean Water Management Fund grant	McCann 2006; deVries 2012; Fraser 2003
Ames, Cherokee, Des Moines, Louisa County, Wapello Iowa	1993 Great Flood	1993-1995: Numerous towns used buyouts with varying success rates to turn developed property into floodwater retention land and recreation space	1,400 state-wide	State & local partnerships	FEMA HMGP; HUD CDBG; State; Local	Siders 2013; FEMA 2005; Goldschalk et al. 1999
Harris County, Texas	On-going river and coastal floods	1985-Present: Harris County Flood Control District acquires vulnerable properties throughout the county; Restored 1,000 acres to floodplain	2900	County Flood Control District	FEMA; USACE; District	HCFCF 2017, HUD 2015, FEMA 2016
Tulsa, Oklahoma	Arkansas River flood 1984	1984-1998: Had 93 repetitive loss properties in 1984 but only 5 by 1995 due to on-going acquisition	900	City	FEMA; SBA; State sales tax interest (today runoff fee)	Conrad et al. 1998; Carney 2014
Soldiers Grove, Wisconsin	Kickapoo River floods (galvanized by 1978 flood)	1975-1979: Relocated the entire business district and 10 residences to a new location; Invested in solar power (gained nickname "Solar Village")	50	Town Council	HUD; CSA; State; Local	Becker 1983; David & Mayer 1984; Tobin 1992

CSA - Community Services Administration; HUD - Department of Housing and Urban Development; HUD CDBG - HUD Community Development Block Grant; FEMA - Federal Emergency Management Agency; FEMA HMGP - FEMA Hazard Mitigation Grant Program; USACE - U.S. Army Corps of Engineers; SBA - Small Business Administration

3. Results

Across the cases reviewed, there is a lack of transparency regarding the criteria and processes used by government officials to decide which homes to offer to purchase. Officials frequently report buyout decisions as being the result of objective cost-benefit calculations, but this rhetoric masks subjective value decisions inherent in the cost-benefit analysis (CBA) process and overlooks significant political factors. Subjectivity, political influence, and lack of transparency raise the potential for buyouts to have or appear to have socially inequitable results and may reduce legitimacy and participation rates.

3.1. Decision criteria are not transparent

Transparency is a cornerstone of good governance (Hood and Heald 2006). As a principle, it allows people affected by government decisions to know the facts and processes involved in making those decisions. In U.S. buyout decisions neither facts nor processes are transparent. In all cases reviewed, government officials provided public information about the criteria that would be used to determine whether or not a property would be eligible for a buyout offer (see Table 3), but the criteria as stated are broad and over-inclusive, describing many homes not offered buyouts. For example, government documents routinely state that properties must “have a history of flooding”, which, in the aftermath of a flood, applies to many homes, with no explanation of how much or what type of flood history is required. Other criteria state buyouts will be offered in areas “compatib[le] with community and natural values” (HCFCD 2017) or where state and municipal officials “have a mutual understanding of the benefit” (GOSR 2015). Such subjective and value-laden criteria provide little information to homeowners and may reduce trust in the decision-making process (Hood and Heald 2006; Binder and Greer 2016). For example, in a case study of the New York City post-Sandy buyouts, residents described decisions about which properties would be bought out as “haphazard” and expressed mixed levels of trust that officials were acting in residents’ best interests (Binder and Greer 2016).

Subjective criteria also reduce accountability and may raise concerns about fairness (Hood and Heald 2006). As an example, during HUD’s National Disaster Resilience Competition, two proposals to relocate communities out of vulnerable floodplains made it to the final stage of the competition (HUD 2015). HUD did not reveal the specific criteria used to decide among competing proposals, so HUD’s eventual decision to fund one relocation proposal and not the other elicited concerns that the decision was unfair: that HUD had not decided according to who had “the greatest need, or that had waited the longest, or was the most ready” (Flavelle 2016). This is not to say HUD lacked objective criteria or made unfair decisions. Rather, lack of publicly available, explicitly stated criteria coupled with an opaque

decision-making process created the *appearance* of unfairness, and this appearance can undermine faith in the system and reduce future participation.

While decision-making criteria are rarely specific enough to inform homeowners about individual parcels, there are numerous criteria that inform government officials' decisions about which homes to offer to purchase in a floodplain buyout. Table 3 presents a list of these criteria, as found in the academic literature, news reports, and government documentation. Generally, the criteria fall into two categories: those related to financial cost-effectiveness, and those related to political concerns. The following sections draw examples from each category to illustrate social justice concerns that may arise.

Table 3. A non-comprehensive list of factors that influence government decisions about which homes to offer to purchase in voluntary buyout programs. Criteria were identified through a literature and case review. Criteria tend to focus on either financial cost-effectiveness of the purchase or political costs and gains.

Criteria
Cost-Effectiveness
<u>House/Parcel Level</u>
Located in floodway
Located in floodplain (100 year; 500 year; or most recent event)
Extent of damage in recent disaster ("substantially" damaged: 50% or more of pre-disaster property value)
Repetitive loss property / History of flooding damage
Estimated cost to elevate or protect property (e.g., floodwalls)
Property value
Structure type: residential dwelling (primary residence); critical infrastructure (e.g. hospital)
Insured with National Flood Insurance Program (NFIP)
<u>Community Level</u>
Infrastructure density (e.g., urban, developed, agricultural, not-developed)
Potential of space from acquired parcels to provide natural flood buffer
Potential for space from acquired parcels to connect to existing wetlands or parklands
Ability to eliminate or reduce funding for public services or flood protection structures if whole area retreats
Potential to use acquired space for recreation or public parks (and corresponding benefits to property values, health, etc.)
Effect on local tax revenue (i.e., property tax value)
Ability of existing housing market to accommodate displaced homeowners (consider both number of homeowners and housing costs)

Ability of existing housing market to accommodate displaced homeowners within same tax district

Effect on local economy (loss of consumers and employees)

Number of buyout programs in nearby neighborhoods (effect on tax base but also effect on character of the larger area)

Ability to replace lost housing stock

Environmental concerns (e.g., need for toxic cleanup; potential to remove hazardous materials)

Ecosystem conservation benefits (e.g., potential to restore habitat)

Political Concerns

Community organization:

Vocal leader

Strong connections with state and local government

Speed of organization

Unity (high agreement to retreat)

High rates of participation in public engagement re: recovery

Potential to relocate acquired parcels as a community

Community demographics

Competition with other disaster recovery programs

Agreement between local, state, and federal authorities

Agreement with community values

Visibility of project

Potential to use project as demonstration to encourage others to retreat

Likelihood and severity of backlash

Popular opinion in region regarding buyouts

Other political concerns: e.g., election year, election promises

Cultural heritage considerations

Effect of retreat on other community development projects

3.2. *Seemingly objective criteria mask subjective value-laden judgements*

Use of cost-effective decision-making criteria and cost-benefit analysis (CBA) is intended to reduce government waste by providing an objective, economic analysis, but conducting CBA according to current federal guidance and common practice requires subjective value judgements, and over-reliance on cost-effectiveness may yield socially inequitable results.

3.2.1. *Subjectivity in CBA*

Conducting a CBA is not an objective or uncontroversial calculation (see, e.g., Kelman 1981; Nussbaum 2000; Kind et al. 2017). To begin, which costs and benefits should be included? In 2014 FEMA modified its CBA to include reduction in street maintenance costs if a buyout purchased an entire street (O'Grady 2014; FEMA 2015), but other costs avoided (such as reduced public spending on emergency

response and utility maintenance) were not included (see, e.g., FEMA 2015). Including only those costs and benefits easily monetized overlooks potentially important elements. For example, land acquired through a buyout could be maintained as a public park, and parks have been shown to not only increase local property values (Crompton 2005) but also improve physical and mental health and provide air quality and urban heat island reduction services (Kabisch et al. 2015) – all difficult benefits to monetize. Of course, these benefits only accrue if the buyout succeeds in buying up contiguous parcels, something the CBA may not be able to predict and may therefore overlook (Siders 2013a). Similarly, many of the most important costs inherent in a buyout program are not easily monetized (e.g., loss of community). There are also issues of time and geographic scale. Should the CBA weigh costs and benefits over years, decades, or centuries? Should it consider the effect on local, state, or national government? Many costs of retreat are felt locally (e.g., loss of community), while benefits accrue across scales (e.g., individual safety, community insurance premiums lower, national disaster recovery costs avoided). People’s perception of fairness is also altered by the scale at which they consider the question (Alexander and Ryan 2012). Answering these questions requires subjective value-laden choices, not objective calculation.

3.2.2. Potential social inequity in CBA

One unintended consequence of relying on CBA may be to create or perpetuate social inequity. For example, one way for a home to become eligible for an HMGP-funded buyout is for the property to be assessed as being “substantially damaged”: repairs would cost more than 50% of the pre-disaster value (FEMA 2015). Low-value homes are more likely to be declared “substantially damaged” for several reasons. Low-value homes may be located in vulnerable areas, be poorly constructed, or have been built under outdated building codes and therefore sustain more damage (SAMHSA 2017). However, even the same dollar amount of damage (e.g., \$55,000) to a low-value home (e.g., \$100,000) and a high-value home (e.g., \$400,000) could result in a substantial damage finding for the low-value home and not the high. Moreover, de Vries and Fraser (2012) found that officials were more likely to use subjectivity in the damage assessment process to declare homes in low-income neighborhoods to be substantially damaged than in high-income neighborhoods. As a result, more homes in low-income neighborhoods are likely to be eligible for buyouts, potentially leading to a disproportionate effect.

If a home is declared substantially damaged, and the homeowner receives FEMA funds or the home is located in a community covered by the National Flood Insurance Program, the homeowner may still choose to rebuild the home rather than accept a buyout, but the home must “be brought into compliance with local floodplain management regulations” (FEMA 2017). This may require the homeowner to elevate the home or make (often expensive) alterations to reduce risk. In some cases, extra insurance payouts may be available to cover the “Increased Cost of Compliance” (FEMA 2017), but

in general, wealthy homeowners are more likely to be able to afford these alterations. Homeowners unable to afford modifications may find themselves feeling coerced to accept ‘voluntary’ buyouts due to financial constraints (de Vries and Fraser 2012). In Grand Forks, North Dakota, buyouts along the Red River created tensions between lower-income floodplain residents and wealthier city council leaders because residents felt council members were using substantial damage and other findings to force them to accept buyouts (Rakow et al. 2003; Fothergill 2004; Rakow 2005; Shelby 2008). Residents felt the process was so dishonest they filed a class-action lawsuit to attempt to force the city to use eminent domain, to recognize the residents’ unwillingness to move voluntarily (Rakow 2005). As non-voluntary acquisitions trigger a range of additional legal protections and relocation assistance requirements (see, e.g., Uniform Relocation Assistance and Real Property Acquisition Act) and neither HMGP nor CDBG-DR funds cover eminent domain (but do cover 75-100% of the cost of voluntary buyouts, see Table 1), local governments have a financial incentive to pursue voluntary buyouts rather than use their eminent domain or condemnation powers.

Perhaps most significantly, the very logic underpinning CBA prioritizes flood protection of dense, high-value property areas and promotes retreat from low-density, low-value areas. A Cedar Rapids, Iowa, proposal to build levees to protect low-value residential housing was rejected because the benefit of protecting those homes did not outweigh the cost of constructing the levee (Tate et al. 2016). A decision not to protect an area leaves that area exposed, increasing the likelihood that homes in that area will be substantially damaged and be willing and eligible to retreat in the future (Martinich et al. 2013; Upton 2017). Relying on CBA may therefore promote social inequity if it results in the disproportionate protection of wealthy homeowners and relocation of low-income homeowners. The inequity of this approach is especially concerning if participants in buyouts relocate to areas of equal flood risk, higher poverty rates, and greater social vulnerability, as initial research suggests (McGhee 2017).

A case could be made that targeting buyouts in most vulnerable communities would be beneficial, as these communities are least able to recover from disaster (SAMHSA 2017) and may not have the resources to relocate without government assistance. However, such a program may have unintended social equity issues if social equity is not explicitly considered the program design. In New Orleans, for example, an early post-Katrina recovery plan proposed buyouts in severely damaged areas, but, as the neighborhoods most affected by Katrina were largely low-income African American communities, the effect, if not the intent, of the proposal would have been to remove a significant portion of the city’s African American population (Wilcox 2007; Phillips et al. 2012; Gotham and Greenberg 2014). Political backlash was immediate and severe; even discussing buyouts in New Orleans became “political suicide” (Kates et al. 2006; Brady 2015; Rivlin 2015), although the city did later use land-swaps and acquisition programs along with redevelopment to redesign vulnerable areas.

3.3. Political factors play an important but unrecognized role

Buyouts are extremely controversial. They require homeowners to leave their homes and neighborhoods – an action rife with psychological and social consequences (see, e.g., Binder and Greer 2016). Retreat can be seen as failure and re-building as a point of pride. Buyouts may reduce local property tax revenues and affordable housing stock or take desirable development properties off the market. It is therefore unsurprising that buyouts are often shaped by politicians' re-election goals (see Table 3 for political concerns). In New York City, for example, Mayor Bloomberg and several borough leaders voiced opposition to post-Sandy buyouts because they would reduce the city's tax base and exacerbate the affordable housing shortage (Brady 2015; Furman Center 2013). On the other hand, in Cedar Rapids, Iowa, and Grand Forks, North Dakota, buyout programs gained support when local politicians framed the public parks that would be created using acquired lands as part of broader city revitalization efforts (FEMA 2001; Fraser et al. 2003; Tate et al. 2016).

Politicians may shy from appearing to impose buyouts on communities, so buyouts are most common where substantial grassroots support has emerged. In Soldiers Grove, Wisconsin, town members seeking relocation funding invited congressmen to visit during the 1978 Kickapoo River flood (Becker 1983). The town received funding shortly thereafter. Similarly, in Staten Island, when residents of Oakwood Beach wanted a buyout and were told New York City would not support it, they called their State Senators, some of whom were described as close friends of Oakwood residents, and put pressure on the state government to offer a buyout (Brady 2015). Brady (2015) reports that some New York officials described Governor Cuomo's decision to support buyouts as influenced by a desire to be seen as responsive to constituent desires. In this light, it is notable that the rhetoric around the Oakwood Beach buyout initially focused not on cost-effective risk reduction but on an emotional need to help disaster victims (Brady 2015). Political tensions between New York state and city governments may also explain why having "mutual" state and local support for buyouts was explicitly listed as a criteria for eligibility in New York buyout guidelines (GOSR 2015), why homeowners received a bonus payment if they relocated within New York City (to maintain the tax base; GOSR 2015), and why only two of the five neighborhoods in Staten Island that applied for buyouts were approved: these outcomes struck a balance between state and city goals.

Community support for buyouts may avoid coercive buyouts and increase trust in the process, but there are still equity concerns with waiting for grassroots efforts to promote buyouts. Low-income and minority communities may be less likely to have political connections that would provide the voice and clout necessary to request a buyout. When communities are made to compete for funding (as in HUD's National Disaster Resilience Competition), communities with expertise and financial wherewithal to

develop competitive proposals may be more likely to receive funding, rather than those with greatest need.

4. Discussion

Federally funded floodplain buyout programs are intended to reduce long-term economic and human costs associated with floods and storms by reducing the density of infrastructure and population in vulnerable areas. These potential benefits, however, come with potential psychological, social, and economic harms (see Binder et al. 2015). The literature and case review presented here also reveals that buyouts may introduce or exacerbate existing social inequalities.

Subjective decision-making criteria and a lack of transparency introduce the potential for personal bias or political ambition to shape retreat. The analysis herein focused on social inequality that could arise unintentionally, as a result of current decision-making practices. Historic settlement patterns mean that a decision to aid the most vulnerable communities may also have unintended disproportionate effects on low-income and minority groups. This is true if ‘most vulnerable’ communities are defined as those most exposed to floods and storms, and it is doubly true if standard measures of social vulnerability are used, as these measures use low-income and minority status as indicators of high vulnerability so low-income or minority communities are, by definition, most vulnerable (e.g., Social Vulnerability Index, SOVI). But it is also possible that subjectivity and lack of transparency could allow officials to purposefully target communities for retreat, whether maliciously, as an attempt to remove portions of the community; pragmatically, targeting affordable housing in order to purchase the most homes with limited funding; or beneficially, as an attempt to aid those at greatest risk. Even when conducted with beneficial intent, however, programs purposefully targeted at vulnerable populations are most likely to avoid inequity if they consider social justice as an integral part of program design and if they are chosen through a transparent and participatory pre-disaster planning process. To date, it is not clear whether U.S. buyout programs have intentionally targeted vulnerable populations or have been the unintended result of an ad hoc process.

Results also suggest, in some cases, well-intentioned regulations and incentives may be interacting in unintended ways. For example, federal funding requirements for buyouts to be voluntary were established to protect homeowners, but they provide a strong incentive for local governments to pursue voluntary programs even when non-voluntary condemnation or eminent domain proceedings could provide arguably superior outcomes (e.g., by protecting homeowners from significant risks or by enabling purchase of continuous swaths of land to be used for natural flood defense). As non-voluntary proceedings also require additional procedural protections and relocation benefits for homeowners,

they may also protect against some of the known harms of voluntary buyouts, although this remains an open research question.

One of the major results of this study is to illustrate potential social justice concerns raised by CBA. As noted, cost-benefit logic prioritizes flood defense in affluent, high-density areas, while promoting retreat in areas of sparse infrastructure and population: a logical but not necessarily desirable condition. CBA is a pragmatic tool, and it not only overlooks but may actually mask ethical dilemmas (see, e.g., Nussbaum 2000). Benefits of retreat, for example, often accumulate to the community or nation, while harms affect individuals, and CBA provides no guidance as to how such individual harms are to be balanced against societal gains or who should be involved in making such choices. CBA focuses on pragmatic analysis of alternative actions rather than prompting a discussion around the moral consequences of actions (see Nussbaum 2000). Managed retreat is plagued by the dilemma that purposefully relocating low-income communities is socially inequitable and may harm those communities, but not relocating low-income communities, leaving them in floodplains exposed to future hazards (even if protected by barriers), is also socially inequitable and may cause harm. Turning to CBA to decide when and where to retreat may avoid the ethical discussion necessary to address this dilemma.

None of the results reported herein mean the United States should abandon managed retreat as a climate adaptation strategy or that retreat must be inherently inequitable. Rather, results indicate that U.S. buyouts, as currently practiced, lack transparency and involve a series of subjective decisions that may disproportionately affect low-income residents. The challenge presented is to find solutions. Five recommendations emerge from the case studies and literature that could improve future buyout decisions.

Increase transparency. The goals of retreat (e.g., whether to reduce future costs, aid disaster victims, or restore natural floodplains) and the criteria used to decide which properties will be acquired should be stated as explicitly and publicly as possible. Transparency is necessary to establish trust in government processes (Hood and Heald 2006), which will be needed if managed retreat is to become a larger part of U.S. climate adaptation. Transparency does not mean criteria must be monetized or numeric. Rather, criteria should be specific and understandable to the public (e.g., not “meet environmental goals” but “maximize the area available for wetland restoration”). Clearly stated goals and decision criteria would also aid efforts to evaluate buyout outcomes, an area of research lacking to date (McGhee 2017).

Emphasize relocation. As retreat becomes an option for larger communities, it will become necessary to offer an alternative location: where should people go? Few studies have explored where homeowners relocate, but there is some evidence that, without assistance, residents relocate in

neighborhoods with equal or greater flood risk and increased social vulnerability (McGhee 2017). This is problematic, as children who move to areas of lower income have been shown to earn lower incomes as adults (Chetty and Hendren 2018). Future research will be needed to understand where and why homeowners relocate, but future programs could provide more assistance in the relocation process and greater emphasis on developing affordable housing in non-vulnerable spaces. Additionally, reframing buyouts not as retreat due to failure but as opportunity to redesign the community, emphasizing relocation to rather than retreat from, may have a better chance of inspiring political support.

Address long-term social Inequality head on. The United States has a long history of social inequality that has manifested in low-income and minority populations living in vulnerable areas (Bolin and Bolton 1986; Mileti 1999; Kates et al. 2006; Freudenberg et al. 2016). When buyouts disrupt communities, they may exacerbate this inequality (Oliver-Smith 1990; Wilcox 2007; Gotham 2014). But not acting – leaving low-income and minority populations in areas known to be hazardous or using federal funding to rebuild in those areas – also perpetuates inequality. There are strong arguments in favor of disproportionately retreating low-income communities as they are at greatest risk and have fewest resources to recover (SAMHSA 2017). However, targeted retreat of vulnerable communities is most likely to succeed if it is an explicit goal, rather than a chance happenstance. A purposeful program to relocate vulnerable communities should address social justice concerns in its design and be the result of a transparent participatory process in which targeted retreat is established as a goal. Such discussions around the long-term goals of floodplain adaptation may also benefit from mention of public trust doctrine, a legal obligation for government to ensure that residents of all socioeconomic backgrounds have access to the coasts (Peloso and Caldwell 2011).

Conduct more holistic CBA using larger geographic scales and longer decision timelines. Perceptions of equity change depending on timelines and geographic scale (Alexander and Ryan 2012), as do the results of CBA calculations. When federal tax dollars are used to fund buyout programs, it may make sense to calculate costs and benefits at a national, rather than local, scale. And, as the consequences of climate adaptation decisions will be felt for decades, if not longer, their relative costs and benefits should be calculated over a similar time scale (de Vries and Fraser 2017). A decision that appears disastrous today may be sensible or even inevitable over the coming years. Making decisions at larger and longer scales may also increase the ability of decision-makers to discuss relocation and social inequality.

Engage in participatory pre-disaster planning to gain political support. After a major disaster, decision-makers and homeowners are emotionally overwhelmed (de Vries and Fraser 2012), and the long processes involved in relocating can wear down residents' commitment to participate (Conrad et al. 1998; Fraser et al. 2003; Freudenberg et al. 2016). Pre-disaster planning, especially participatory

planning, can shorten timelines and raise awareness to help communities prepare emotionally and financially for the day when retreat may be necessary (de Vries and Fraser 2012). Public participation has also been shown to decrease political resistance to managed retreat when residents feel government officials are listening and taking resident concerns into account (as illustrated by the Grand Forks, ND, case; see, Grisez Kweit and Kweit 2007).

5. Conclusion

Current decision-making practices in U.S. floodplain property acquisition programs raise significant potential social justice concerns. The manner in which decisions are made about which properties to acquire is not transparent, creating the potential for bias and public distrust in the system. Furthermore, the value and logic structure underlying many decision criteria, based on economic cost-benefit analysis, leads to a disproportionate effect on low-income communities, which can exacerbate historic inequalities unless countered by targeted efforts to address inequity. Conversely, reliance on grassroots political support to initiate managed retreat can favor relocation of less vulnerable communities who have the voice and clout to request assistance, leaving those most vulnerable to disaster still living in the floodplain. Yet inaction, failure to address social justice issues head-on, will allow historic inequalities to perpetuate. Such dilemmas are unlikely to be resolved through the ad hoc and under-researched processes used by U.S. decision-makers to allocate adaptation responses to date. Rather, promoting long-term adaptation and equity in the floodplains will require a conscious effort to address social justice.

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