

UNDERSTANDING THE INTERACTION BETWEEN SOCIAL EQUITY AND CLIMATE ADAPTATION:

An analysis of nature-based flood adaptation strategies in New York State

A TNC NatureNet Fellowship Project



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EXECUTIVE SUMMARY



This report summarizes a multi-year research project that sought to better understand the interactions between climate adaptation and social equity, specifically in the context of nature-based solutions to flooding in New York State. The research is a collaboration between scientists at the University of Colorado Boulder and The New York Division of The Nature Conservancy. The report summarizes three separate studies:

1. A scoping review of the scientific literature on climate adaptation and justice and equity,
2. An equity analysis of a regional flood buyout program and
3. An investigation of the cognitive models local municipal leaders have about the relationship between floodplain protections and affordable housing.

This report concludes by presenting a framework for navigating the complexity of equity-adaptation interactions, and a training guide designed for adaptation practitioners to apply the framework in their own work.

INTRODUCTION

The impacts of climate change, once viewed as consequences for the future, are now a present-day reality (Pörtner et al., 2022). According to the National Oceanic and Atmospheric Administration, the U.S. experienced 360 ‘sustained weather and climate disasters’ since 1980, costing more than 2.48 trillion dollars (NOAA, 2023). Further, the average disaster per year from 1980-2022 was 8.1, whereas the average disaster from 2018-2022 was 18.0 (NOAA, 2023). In response to these trends, scientific experts and policy makers alike have begun to underscore the importance of adaptation (defined as the ‘processes of adjustment to actual or expected climate and its effects’ (IPCC, 2014, pp.5)), as a critical tool for addressing the climate crisis (Chu et al., 2019; Shi & Moser, 2021). Specifically, many commonly utilized adaptation strategies are nature-based solutions (NbS), or “actions to protect, sustainably manage and restore natural and modified ecosystems in ways that address societal challenges effectively and adaptively, to provide both human well-being and biodiversity benefits” (Cohen-Shacham et al. 2016). Examples of NbS include protecting forests from deforestation for their carbon sequestration potential or restoring coastal wetlands to buffer coastal communities from storm surge and flooding. These approaches are often viewed as a ‘win-win’ strategy for both people and nature. However, adaptation strategies, including NbS, are shaped by the institutional systems from which they emerge and are affected by the same injustices and inequities that shape the rest of society (Paavola & Adger, 2006; Walker et al., 2022). The interaction between NbS and dynamic social systems can result in outcomes that are more nuanced and complex than the popular ‘win-win’ terminology indicates. One example of such complexity is the interaction between nature-based climate adaptation strategies and issues of social equity.

On one hand, adaptation strategies provide opportunities to address issues of equity and achieve social justice. One example of this is using green infrastructure to address stormwater challenges in vulnerable communities that simultaneously improve public health outcomes by increasing access to nearby nature or green space. In one study, a Health Equity Impact Assessment concluded that publicly accessible green infrastructure led to positive physical and mental health outcomes for vulnerable communities in Ontario, Canada (Anderson et al., 2021). Additionally, adaptation planning can be used as an opportunity to engage and prioritize the voices of communities that have historically been excluded from urban and municipal planning processes. For example, in Barcelona, Spain, city officials have designed plans to increase urban green amenities that prioritize gender fairness and center low income and minority residents in planning (Amorim-Maia et al., 2022). Despite these successes, adaptation strategies can also exacerbate or create new inequities. Without considering impacts on housing markets and housing affordability, the use of green infrastructure to deal with flooding and storm water in vulnerable communities can also lead to gentrification. In Philadelphia, for example, a climate adaptation program aimed at increasing green infrastructure in at-risk neighborhoods led to gentrification and the emigration of minority communities



(Shokry et al., 2020). Furthermore, without actively working to dismantle the pre-existing equity issues that create barriers for certain social groups from engaging in community planning processes, adaptation planning can further exacerbate exclusion in local decision-making. Studies of adaptation planning processes in Nepal, for example, found that actors from low castes and Indigenous groups were excluded from decision-making processes due to conscious and subconscious cognitive biases and normative and institutional barriers (Forsyth & McDermott, 2022). These are just a few of the examples highlighting the complex interactions between equity and NbS for climate adaptation. When used thoughtfully, NbS can be used to achieve equitable adaptation, but when this interaction is ignored, the unintended consequences of such strategies can exacerbate the vulnerability of marginalized groups.

In recognition of these interactions and the potential for unforeseen consequences, researchers are paying increasing attention to the equity and justice implications of climate adaptation and NbS (Araos et al., 2021; Coggins et al., 2021). However, researchers across disciplines have contributed to literature in climate adaptation and social justice and, as a result, have relied on a variety of conceptual approaches for investigating equity issues and use different terminology to discuss similar constructs (Palmer et al., 2016). Simultaneously, policy makers and practitioners require clear guidance and concrete strategies for translating science into policy and practice (Antonopoulou et al., 2021). Further, any conceptual clarity required to guide more equitable adaptation practice needs to be grounded in case studies.

This report summarizes a large-scale research study that sought to better understand the nuanced interactions between NbS adaptation and equity issues, with a particular focus on adaptation to flooding. The following pages include:

1. A scoping review that attempts to provide conceptual clarity to how we should think about justice and equity in climate adaptation contexts
2. An equity analysis of a regional flood buyout program
3. An analysis of the cognitive models local leaders use to understand any potential connection between floodplain protections and affordable housing
4. A practitioner toolkit that synthesizes the lessons learned from the research and translates this evidence into applied practice.

This work was conducted in partnership with the climate adaptation team of the New York Division of The Nature Conservancy (TNC) and the project is part of larger TNC program - the NatureNet Science Fellowship. The purpose of the NatureNet program is to support the development of interdisciplinary conservation science leaders. Accordingly, the research conducted in the following pages is interdisciplinary with an applied focus.

A note about terminology:

We recognize that the terms equity and justice are frequently used interchangeably by both scholars and practitioners. For the purposes of this brief, we use the terms equity to refer to the fairness of the current state, and justice as actions taken to address equity concerns with a specific focus on minoritized social groups with respect to environmental benefits and burdens. In some places we will use the abbreviation J/E to broadly refer to both justice and equity. Our scoping review uses the J/E terminology because the climate adaptation literature uses both terms, often similarly. In contrast, we specifically use the equity terminology in our case study research, as this work evaluates a current state of adaptation strategies. The recommendations we make in these case studies are therefore suggestions for achieving justice. Not all adaptation experts use these terms in this way. We acknowledge the diversity of ways these terms can and should be applied and underscore the importance of clearly communicating what is meant when using such terminology.

METHODOLOGICAL APPROACH

The initial phases of work focused on understanding the priorities and evidence needs of TNC's climate adaptation team in New York. This team identified a need for more information about the 'on the ground' interactions between equity and climate adaptation, particularly flood adaptation. The team also identified a need for tools and guidance for practitioners without formal training in the social sciences to navigate the complexity of the equity issues they were seeing in their adaptation work. As a result, this work is based on trying to help fill these gaps, as well as pull heavily from a New York context. However, we believe the lessons learned from this work reach far beyond the contexts of New York State and flooding adaptation.

To meet the needs of TNC partners, our research approach sought to combine a case study analysis with a broader investigation of the existing literature on the interaction between climate adaptation and equity. For the case study component, several factors informed the selection of the watershed for the analysis. We selected a watershed where 1) we identified potential equity issues using census data, 2) TNC had an existing relationship with local watershed communities and 3) TNC had previously identified the watershed as a high priority for their flood adaptation work.

We first conducted key informant interviews to determine the applied value of the various adaptation foci within multiple communities that met our criteria. Based on these interviews, we narrowed down our research to two specific case studies. Both case studies used a combination of semi-structured interviews and public document analysis. More details about the methodology used in each case study can be found in the following pages.

Concurrently to our case study research, we conducted a scoping review of the scientific literature on climate change adaptation and J/E. A scoping review is an analysis that aims to understand and synthesize the existing literature on a certain topic. Our scoping review explored the existing publication trends in climate adaptation and J/E scholarship and how the authors of the existing literature conceptualize and define justice and equity.

Based on the results of our review, we created an equity analysis framework that can be used to systematically conceptualize and understand equity considerations in the context of climate change adaptation work. We tested that framework by applying it within our case study communities and developing recommendations to improve the equitability of the flood adaptation strategies program. The final outcome of this work is the creation of a training guide, grounded in the data from this research (case study and scoping review), that can be used by practitioners to design more effective, equitable, and just climate adaptation strategies.

All data collected in this study was approved by University of Colorado's institutional review board (protocol #21-0497) and TNC's internal ethics review process.

STUDY 1: SCOPING REVIEW

DEFINING AND CONCEPTUALIZING EQUITY & JUSTICE IN CLIMATE ADAPTATION

Study Purpose

Scientists and policy makers are increasingly emphasizing and prioritizing climate change adaptation strategies. These strategies, however, do not occur in isolation from existing injustices and inequities (Paavola & Adger, 2006; Walker et al., 2022). Both researchers and policymakers have begun to recognize this interaction and are paying increased attention to the equity and justice implications of climate adaptation. This scoping review aims to investigate the diversity of ways in which climate adaptation researchers conceptualize justice and equity (J/E) and synthesize common frameworks, approaches, and findings. Our results lend insights into emerging practices, future research needs, and implications for policy and practice.

This policy brief highlights relevant insights for policymakers and practitioners, specifically, within the larger findings of our review. The specific research questions that guided the scoping review summarized by this brief are:

1. What are the publication trends in climate adaptation and J/E scholarship – specifically, what social identities, climate hazards, and geographic contexts have been studied?
2. How do climate adaptation scholars conceptualize and define J/E?

Conceptualizing Climate Justice

Issues of J/E are central to understanding how the climate crisis impacts communities around the world (Sultana, 2022). Climate change scholars rely on a variety of definitions and frameworks of J/E, resulting in a need for literature synthesis providing clarity on how and when such conceptual tools overlap. Much of the work investigating the climate crisis from a justice lens applies the work of David Schlosberg, who presents a multidimensional framework of environmental justice (2004). This commonly referenced framework categorizes environmental justice into three dimensions: the distribution of costs, risks, and benefits (distributional justice); the meaningful inclusion of affected groups in decision-making (procedural justice); and the prioritization of the well-being, knowledge, and perspectives of affected groups (recognition justice). Schlosberg's approach to justice has been widely used in climate and environmental spaces, and has been adapted and expanded by other scholars to include structural justice, the recognition of institutions and systems that shape people's ability to participate in decision-making processes (Law et al., 2018; McDermott et al., 2013). While this framework is popular among scholars, there is a need to clarify its relationship with other justice frameworks and its overlap with the concept of equity. Further investigation into the linkages and distinctions between approaches is also needed before more nuanced understandings of these various approaches can be effectively applied to policy and practice.

As scientists and policy makers increasingly recognize adaptation as a critical strategy for addressing climate change impacts (Chu et al., 2019; Shi & Moser, 2021), significant literature has started to document the ways in which J/E issues interact with climate adaptation. This body of work demonstrates how historically marginalized communities are subject to pre-existing inequities that increase vulnerabilities and limit adaptive capacity (Anguelovski et al., 2016; Antwi-Agyei et al., 2021; Maru et al., 2014). Research has also shown that adaptation strategies not grounded in J/E considerations can unintentionally exacerbate or create new inequities (Coggins et al., 2021; Araos 2021), resulting in maladaptation – adaptation strategies that create undesirable outcomes (Bertana et al., 2022).

The J/E implications of adaptation strategies have been studied at different scales, geographic contexts and thematic areas. However, only a small number of studies have attempted to review and synthesize different aspects of research on the nexus of adaptation and J/E. Our review builds upon these studies by addressing key gaps in the assessment of frameworks, conceptual tools and analyses, and the linkages and distinctions between them.

Methods

We conducted a scoping review of peer-reviewed literature related to climate change adaptation and J/E. The review began with the collection of 6,031 articles related to these topics, which were then screened for relevance and accordance with predetermined inclusion criteria. The screening process yielded 316 articles that met our criteria and were included in the review. Data related to study design, aim, characteristics and inclusion of J/E was then extracted for each of the 316 articles by two reviewers. Finally, a combination of qualitative and quantitative methods was used to analyze the extracted data and distill key themes found within the literature.

Results

What are the publication trends in climate adaptation and J/E scholarship?

Several publication trends emerged in our analysis of the 316 articles. First, the number of publications discussing climate adaptation and J/E has significantly increased over the past decade, nearly doubling between 2020 and 2021. Second, the most frequent theme of the analyzed articles presented conceptual or theoretical framings for understanding adaptation without a specific adaptation context (35% of articles), followed by 20% focused on policy and governance issues and 19% discussing the evaluation of adaptation outcomes. Third, 71% of articles discussed climate hazards generally without focusing on a single hazard. Only 1% of articles focused on either wildfire or air quality hazards related to climate change. Similarly, most articles (59%) discussed social groups implicated in J/E issues broadly and without mentioning specific identities. Finally, articles were analyzed for geographic scale and location. Forty-nine percent investigated climate change adaptation locally, 15% nationally and 36% internationally. North American and African contexts were the most frequently discussed.

How do climate adaptation scholars conceptualize and define J/E?

Researchers frequently used the terms 'justice' and 'equity' without clearly defining these terms. See Figure 1 for a breakdown of the use and definition of each term in the analyzed articles.

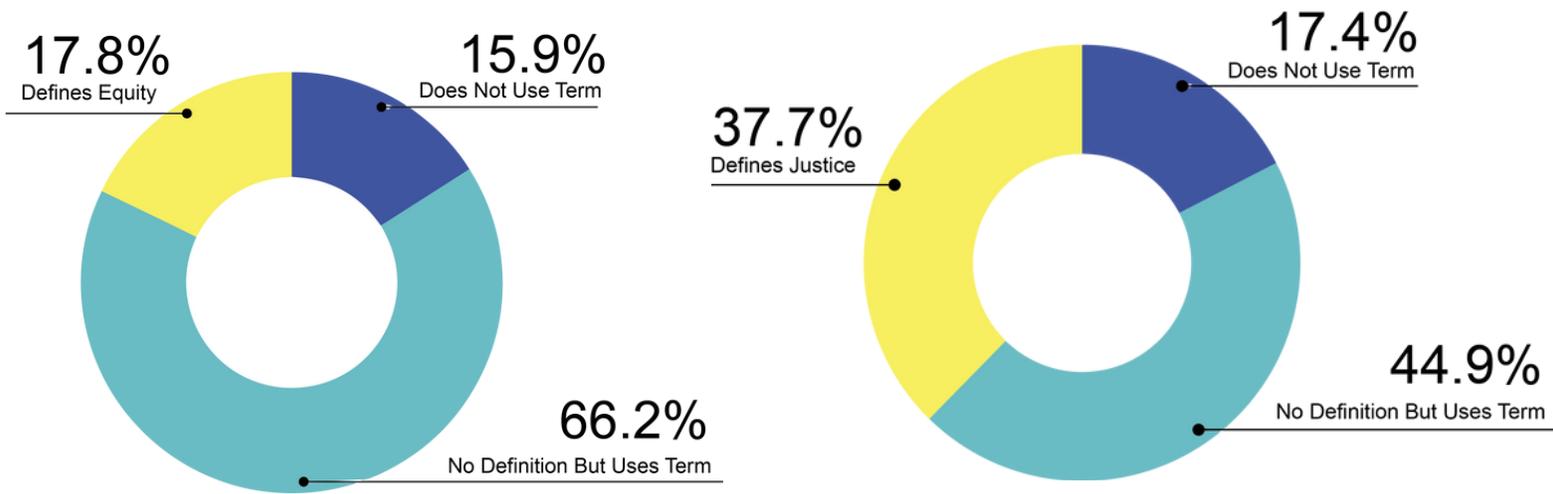


Figure 1. Proportion of studies that defined justice (right) and equity (left)

While many articles did not define J/E, the articles that did include definitions consistently described the same components in their definitions. These components included the actors affected by the J/E issue, the scale of the issue, the pathway(s) of the equity/justice issue and the normative principle(s) used as criteria for J/E. Figure 2 outlines these four components.



Figure 2. Scoping review themes as a framework for breaking down the complexity of J/E issues into tangible analysis questions for climate adaptation practitioners and researchers.

Affected Actors refer to the groups of people implicated in the J/E issue. In nearly all the definitions of J/E, authors mentioned the various groups of people that were involved in or affected by the climate adaptation issue. Two key patterns emerged in the ways authors studied and discussed affected actors. First, some articles defined equity or justice using a comparison of two groups, such as current vs. future generations or Global North vs. Global South. Conversely, other articles focused on the experience of a single social group without explicitly referring to another set of actors, such as the labor burden of livelihood adaptation on women. If articles used a comparison between two groups in their definition, some definitions were focused on intergenerational group comparisons (e.g., social groups from across different generations), while others made intragenerational group comparisons (e.g., social groups within the same generations).

Scale of issue refers to the spatial and governance scale relevant to the J/E issue. Spatial scale was frequently referenced in articles focused on distributive J/E, often in the context of exposure of a particular social group to a climate hazard or risk. Contrastingly, governance scale, referring to the process or entity in a decision-making role (e.g., local, regional or national governments), was commonly discussed in relation to procedural J/E. Articles referencing both equity and justice constructs relied on scale when defining these terms; however, justice definitions tended to discuss the role of scale uniquely, sometimes including a debate over whether the individual or state was the most appropriate unit of analysis for evaluating the justice implications of climate adaptation.

Pathway or type refer to the different ways in which J/E issues materialize in adaptation work. Pathways provide a 'lens' for identifying issues of J/E. Distributive, procedural, recognitional and structural J/E are examples of J/E pathways. These four pathways were the most commonly applied conceptual tool for thinking about J/E in the climate adaptation literature. While some authors refer to these pathways as types of equity and others as types of justice, there seems to be significant consensus on the differentiation between them. Distributional J/E was the most frequently discussed pathway and refers to the difference in risks, costs and benefits of climate adaptation experienced by affected actors; it acknowledges that the distribution of these 'goods' and 'bads' occurs simultaneously and is interconnected. Procedural J/E refers to meaningful involvement of the various actors in decision-making processes. Recognitional J/E references the valuing of experiences, perspectives, knowledge, and well-being of affected actors. A significant, but fewer, number of studies used structural J/E (also sometimes called contextual) to reference the ways in which historical, systemic and pre-existing inequities shape or exacerbate other equity or justice issues. Articles also noted the importance of pluralism, and that these pathways do not occur in isolation, but simultaneously and in connection to one another. Recently published articles referenced this pluralism frequently, and explicitly discuss how structural and recognitional equity lay the 'bedrock' for how distributional and procedural pathways occur.

Principles refer to the criteria used to evaluate whether J/E was achieved. For example, a pathway lens can guide a J/E analysis to focus on the disproportionate amount of adaptation burdens a social group might experience (distributional J/E) but a principle lens helps determine how to evaluate what is considered a 'disproportionate amount.' Any criterion used to answer this question is normative in nature and includes a multitude of options. The included articles referenced a variety of normative principles that we broadly categorized into needs-based, egalitarian, rights-based, capabilities and corrective approaches.

Articles that used a needs-based principle argued that J/E should be concerned with prioritizing the needs of the most vulnerable, while articles that describe egalitarian approaches discussed equal division of resources and processes. Articles also applied and discussed rights-based approaches, advocating for a common ‘threshold’ of rights that all groups and individuals should have, while others relied on the capabilities approach, a more abstract but widely referenced argument for ensuring everyone can live the life they value. Finally, corrective approaches focused on historical responsibility and current capacity as criteria for who should pay the costs of equitable or just climate adaptation. Strikingly, definitions of justice frequently discussed these principles while equity definitions relied more heavily on the vague and normative term ‘fair’ as the principle.

Recommendations

Based on these findings, we have outlined two key recommendations for future researchers, policymakers and practitioners working at the intersection of climate adaptation and J/E.

Recommendation 1: Collaboration between research and practice should direct attention to understudied climate hazards and social identities

We found that previous studies tended to discuss issues of J/E very broadly, particularly when it came to social identities and climate hazards. Regarding social identities, a majority of included articles used terms such as ‘historically marginalized’ or ‘vulnerable groups.’ Of the studies that focused on specific identities, shockingly few investigated climate adaptation in the context of Indigenous communities, LGBTQ+ communities, and people with disabilities. Researchers and adaptation practitioners should leverage collaborative efforts to better understand climate adaptation with understudied populations to avoid further marginalizing these groups by relegating them to the margins of the literature.

Similarly, the included articles tended to conceptualize climate hazards broadly and very few articles specifically discussed wildfire, air quality and disease vectors. Collaborative efforts between practitioners and researchers should focus on increasing the number of empirical assessments focused on these understudied identities and hazards.

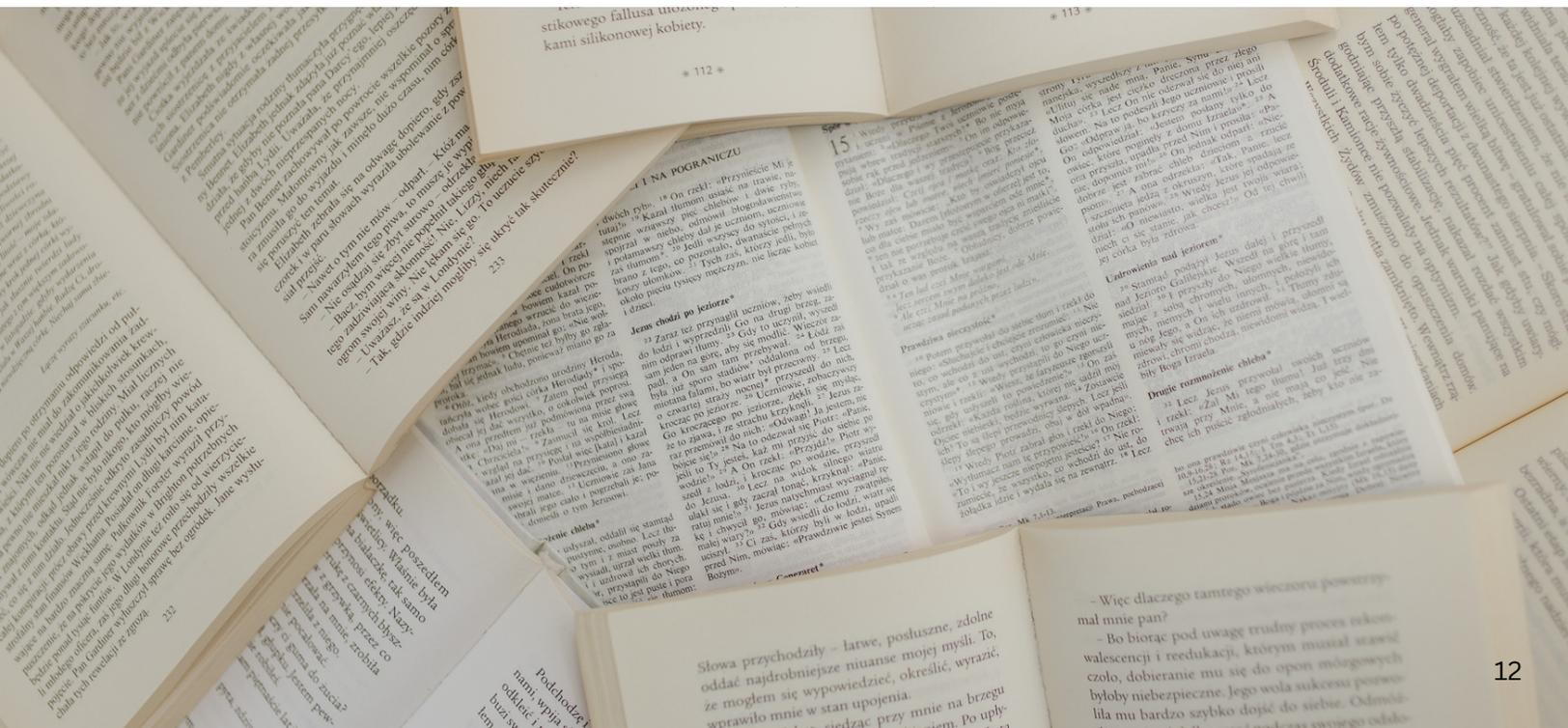
Recommendation 2: Climate adaptation project design and evaluation should utilize the affected actor, scale, pathway(s) and principle(s) components to clearly define and conceptualize J/E concerns

One of the most important takeaways from our results is an unsurprising yet important paradox – the included articles are highly interdisciplinary, but most articles also lack specificity, clarity and consistency in defining key terms. To be clear, we are not arguing for a universal definition of J/E to be used across climate adaptation literature. We recognize that such issues are nuanced and complex, and therefore need to be defined and operationalized in ways that are specific to contexts, scales and the needs of impacted communities. Therefore, rather than agreeing on a single definition, we suggest articulating the affected actors that are involved or implicated in the justice or equity issues, the scale of analysis, the pathway used to analyze the equity and justice issues and the normative principle applied as an evaluative criterion. By first determining how J/E issues may materialize (pathway) and how one would know if an adaptation strategy was just and/or equitable (principle), that researchers, policymakers and practitioners working at the intersection of climate adaptation and J/E can then determine which frameworks are most appropriate for their context.

Conclusion

The findings from this review highlight the recent and rapid increase in scholarship focused on the J/E implications of climate adaptation. Our results indicate that climate adaptation research focused on J/E is often broad with respect to social identities, geographies, specific climate hazards, and J/E conceptualizations. Most significantly, our findings underscore the interdisciplinary nature of J/E and adaptation literature, which we believe explains an additional finding from our review - rarely does the literature clearly define J/E. We suggest that the themes from our analysis (affected actors, the scale, the pathway and principle) provide helpful guidance for clearly explaining the nuances of J/E and adaptation work. They can also be utilized to support the selection of frameworks that are best suited for designing equitable and just climate adaptation strategies. By clearly articulating these themes and frameworks, climate adaptation research, practice and policy can more specifically and consistently address J/E implications and further equitable and just climate solutions.

Note: The full results of this study can be [found here](#).



STUDY 2: AN EQUITY ANALYSIS

BUYOUTS AS NATURE-BASED FLOOD ADAPTATION IN THE NEW YORK CATSKILLS

Study Purpose

The purpose of this study was to conduct an equity analysis of a regional flood buyout program. This case study focuses on a small community in the Catskills region of New York State and a buyout program facilitated by New York City's Department of Environmental Protection (DEP). Buyout programs are an important climate adaptation strategy for reducing risk posed by flooding. They also occur in complicated social-ecological systems, where issues of justice and equity influence the impacts and processes of such initiatives. This case study highlights the 'on the ground' social justice implications of buyouts and makes recommendations that leverage the program's potential for equitable impact.

Nature-based Solutions for Climate Adaptation

As the impacts of climate change increasingly become a present-day reality, scientists and policymakers are calling for increased investment in climate adaptation strategies (Chu et al., 2019; Shi & Moser, 2021). Nature-based solutions (NbS) are a type of adaptation strategy and can be defined as the "actions to protect, sustainably manage and restore natural and modified ecosystems in ways that address societal challenges effectively and adaptively, to provide both human well-being and biodiversity benefits" (IUCN, Cohen-Shacham et al. 2016). Due to their characterization as a win for 'both people and nature,' NbS are increasing in popularity in the United States and globally (Seddon et al., 2020). Specifically, NbS are commonly used to adapt to and mitigate flood risk by protecting and restoring floodplains. NbS hold significant, albeit understudied, promise for reducing the economic and social impacts of flooding, and simultaneously supporting the biodiversity and ecological function of local ecosystems (Pineda-Pinto et al., 2021.; Woroniecki et al., 2019).

Despite such promise, we know that NbS don't exist in an ecological vacuum but interact and are shaped by the social and economic systems in which they exist. An equity lens is an important tool to better understand these interactions (Walker et al., 2022). In this brief, we use equity to broadly refer to the fair distribution of impacts and engagement of actors in decision-making processes, with a specific focus on minoritized social groups with respect to environmental benefits and burdens.

Recent research demonstrates that adaptation strategies not grounded in equity considerations can be maladaptive by unintentionally exacerbating or creating inequities (Coggins et al., 2021; Araos 2021). In Philadelphia, for example, neighborhoods that saw the greatest investment in green infrastructure to absorb stormwater also saw the highest levels of gentrification, pushing marginalized communities into neighborhoods without the same investment in adaptation action (Angelovski et al., 2016). It is necessary, therefore, to center equity and justice in adaptation planning to avoid approaches that replicate exclusionary, extractive and harmful policies.

Buyouts as NbS for Climate Adaptation:

Buyouts (also referred to as strategic or managed retreat) occur when risk-prone properties are purchased to move infrastructure and people out of harm's way. In the US, buyouts have most commonly been used as a climate adaptation strategy in the context of flood risk reduction. Buyouts are often facilitated by government agencies and are often supported by environmentalists for their potential to restore and protect the ecological integrity of floodplains (see Mach et al., 2019 for a discussion on buyouts, how they work, and potential impacts). As buyouts receive increasing attention as a potential climate adaptation strategy, understanding how they interact with issues of equity in various types of communities is critical to support effective and equitable climate adaptation.

The Case

The community at the center of this case study is a small town in the Catskills region of New York State. We will refrain from naming the community or providing identifying details in an effort to protect the anonymity of participants.

The community is a rural town located within the New York City's water supply system (see [NYC DEP's website](#) for a more thorough description of the water supply system) and is eligible for the NYC DEP's Land Acquisition Program (LAP). The DEP's Land Acquisition Program is mandated to protect the water quality in the watershed as well as prioritize the vitality of communities located in the watershed (see [NYC DEP's website](#) for a more in depth description of the program). The Land Acquisition Program has a long and controversial reputation in local watershed communities due to its rapid land acquisition and subsequent control over land use in the region. In 1997, prior to receiving the legal authority to acquire land in the Catskills, the total city and state-protected land within the west-of-Hudson (WOH) watersheds was 24%. By 2018, that number was 40%, with over 154,000 acres acquired through fees or easement, at a cost of nearly \$500 million (National Academies of Sciences, Engineering, and Medicine, 2020).

The New York City Funded Flood Buy Out (NYCFFBO) program is one of several programs under the LAP used to help New York City reduce potential pollution sources. From a water quality standpoint, the program seeks to remove potential debris and pollution from infrastructure that, when flooded, could enter waterways.

The NYCFFBO was created in response to a series of flooding events (most notably Hurricane Irene in 2011) that devastated the Catskills region. After significant discussion between watershed communities and NYC DEP, the voluntary program was established in 2016 to help move people and infrastructure out of high flood risk areas as well as mitigate water quality impacts associated with major flood events.

In essence, before a property owner can qualify for the program, the property must be at high risk for flooding (according to various criteria on a local flood analysis) and receive local government approval. Once the property is appraised and a price is agreed upon by both the property owner and the DEP, the property is purchased and transferred to either local or city ownership. Before a sale can be executed, reuse plans are established to prevent future development and only allow for conservation and recreational activities. The program tries to encourage the relocation of people and rebuilding of infrastructure within the community by making some funds available for relocation costs.

This case study analysis uses an equity lens to examine the use of the NYCFFBO program in a small rural community. Specifically, this work sought to answer the following questions in the context of the case study community:

1. What are the impacts of the program and who do they affect?
2. How are decisions made and are all parties authentically engaged in this process?
3. What outcomes does the program really prioritize? Whose experience does it prioritize?
4. What pre-existing equity issues influence the processes and outcomes of the buyout program?

The paragraphs that follow outline our data collection and analysis process, findings and recommendations for leveraging the potential of the program to effectively and equitably improve the holistic resilience of rural communities in the NYC drinking watershed.

Methods

Our research process started with key informant interviews. These interviews focused on understanding local experiences with flooding, local strategies for adaptation and the social and economic contexts. These key informant interviews helped narrow our research focus to the buyout program. We were also able to gain feedback on the research questions and process to help make the findings useful for program facilitators and local leaders.

Our next step was a document analysis of online publicly available documents that were relevant to the NYCFFBO program. Using a variety of search engines and websites (i.e., DEP website, town government website etc.), we included 68 documents and 20 media articles, totaling over 4,000 pages of text. Examples of these documents include DEP's Land Acquisition Program reports, town board meeting minutes and program strategic plans.

In addition to the document analysis, we conducted interviews with three groups of people:

- Community members who had previously or were currently participating in the buyout program
- Program facilitators such as local municipal leaders and program staff
- Community residents who were not eligible for the program

In total we interviewed 16 different participants.

To analyze both the documents and interviews, we applied an 'equity' pyramid (see Figure 3) based on the work of Schlosberg (2004, 2007), Law et al. (2018) and McDermot et al., (2013) to help answer our research questions.

All of our data collection was pre-approved by ethics review boards at University Colorado Boulder and The Nature Conservancy.

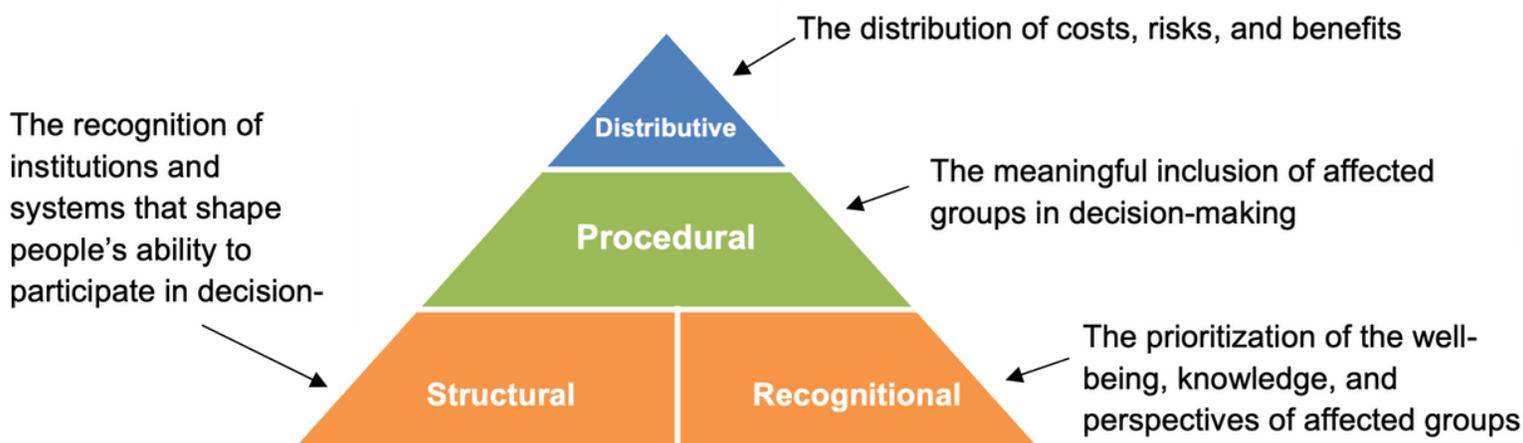


Figure 3. Equity pyramid adapted from Law et al. (2018), McDermot et al. (2013), Schlosberg (2004, 2007).

Results

What are the impacts of the program and who do they affect?

Both interviewees and public documents identified beneficial and harmful impacts of the program. With respect to beneficial impacts, interviewees characterized the program as an effective strategy for reducing risk to flooding and, in some cases, helping alleviate the financial distress experienced by some property owners. Participants strongly underscored this positive impact as a critical aspect of the program.

However, participants also discussed more indirect negative consequences, such as current and future impacts on essential services. This was primarily discussed in the context of threats to healthcare services, housing and food security. For example, a local healthcare clinic that experienced significant flood damage in Hurricane Irene participated in the buyout program and was not relocated within the community, leaving limited access to medical services for local residents both within and outside of the municipality. A second negative impact discussed by participants was potential interactions with the housing affordability crisis. Like many other 'bedroom' communities across the country struggling with housing availability and affordability, community leaders described the difficulty of supporting buyouts while simultaneously addressing issues of housing affordability. Our document analysis indicates that completed and slotted properties for buyouts have resulted in the removal of a handful of housing units in the community and will result in more in the future. While a 'handful' of housing units would not stand out in a regional analysis of program impacts, community members insisted that even the loss of a few units in such a rural community has palpable impacts on local housing challenges. Additionally, one of the local emergency response stations is participating in the buyout, and while interviewees highlighted the importance of moving the station out of the floodplain, they also noted challenges in accessing sufficient relocation funds and noted concerns over how relocation efforts had caused the local emergency response organization to take on considerable debt.

A third major impact participants mentioned was the program's effect on community culture and cohesion. Local leaders and residents suggested that the buyout program does not do enough to address the loss of

businesses and residents, failing to “make the community whole” again after buying out properties. Interviewees urged for a more holistic approach to community needs and an acknowledgement that the program is not just about property values and money, but also about the social fabric of the community.

Finally, participants expressed that these impacts unevenly affect residents of the community, based on one’s tenure in the community and other factors such as age and income. One participant noted, “I think it’s harder to let go of something that’s been in your family for generations.” In general, long-time residents were described as having deeper place attachment and a more difficult time adjusting emotionally to these changes in the community.

How are decisions made and are all parties authentically engaged in this process?

Our data paints a picture of a program that is intentionally designed to prioritize local community decision-making but inadequately takes into consideration the complexities of community engagement and power dynamics in program planning.

In terms of program design, our data highlights numerous positive program processes that prioritize local community agency, such as:

1. Requiring municipalities to have the final say on both community participation and individual property agreements
2. Locally led outreach to eligible property owners about the program
3. Option for communities to take ownership of the property once structures have been removed

However, participants indicated that when it comes to process and centering the local community in decision-making, the program still experiences some significant challenges. One participant stated that community meetings held to solicit input felt superficial and intentionally limited, as though the decision-making process already had a “*predetermined outcome*.” Additionally, participants reflected on how much decision-making individual property owners had, given the lack of other affordable and adequate adaptation options. Overall, residents agreed that the buyout program is a better option for residents than other government-funded options (such as FEMA’s buyout program) or doing nothing at all, but felt that if they rejected a buyout offer, they had few other options. This prompts reflection into whether the buyout program is providing a truly voluntary, long-term solution for the community, or if it is just the best out of a set of bad options for community members.

Furthermore, there was an overall impression that there is a need for a more holistic approach to buyout program planning and decisions. One participant noted that it would have been beneficial to “*look at the program as a whole*” further in advance, and develop more robust decision-making structures, rules and definitions.

Finally, while participants struggled with the fast speed of the buyout planning process, they also lamented the lengthy buyout approval process. The continued risk of living in areas highly susceptible to flooding, as well as the urgent need for the financial resources buyouts provide, prompted many participants to believe that the current process is too slow.

What outcomes does the program really prioritize? Whose experience does it prioritize?

The tension between the multiple buyout program priorities was apparent in the analyses of both public documents and interview responses. The most obvious tension was between the dual intended outcomes of the larger Land Acquisition Program: improving water quality for the city of New York while safeguarding the vitality and well-being of the rural communities in the watershed. Multiple interviewees described the reality that water quality is the ultimate priority of the program, above any impact on rural community well-being, as a fundamental challenge. Simultaneously, our document analysis found a striking lack of evaluation metrics (including in program evaluation reports) used to measure community impact. However, interviewees indicated that the program is working to address this gap, as a recent assessment by the National Academy of Sciences previously highlighted the need for indicators of community-level impact (2020). The program has also recently dropped the cost-benefit analysis requirement in recognition of the difficulty of monetizing benefits around community resilience and well-being, particularly in non-urban communities.

Tensions between water quality and rural community well-being are not the only ones at play. A common tension reported by community members is the difficulty in prioritizing the needs of individual property owners and the community at large. Interviews indicated that the program seems to be designed around the needs of property owners as individuals, rather than properties and people as part of a larger community. Participants highlighted the importance of viewing buyout properties through a community lens and understanding the compounding community effects of the loss of a residential or commercial property.

The buyout program also must contend with tensions between short-term and long-term resilience. The program seems to be designed primarily around the immediate needs of getting people out of the floodplain. The program considers the longer-term needs of keeping people and business in a community by including funds to support relocation efforts. However, both interviews and document analysis indicated limited success of relocation efforts, largely due to lack of available land, the increasing cost of housing, and a previous lack of proactive, holistic planning.

What pre-existing equity issues influence the processes and outcomes of the buyout program?

Both interviews and public documents underscore multiple examples of how pre-existing equity concerns shape the buyout program. Multiple interviewees brought up the history of eminent domain in the watershed, and the injustices created by forced relocation of communities in the early 1900s to build the reservoirs that make up the New York City drinking water system (see Beisaw, 2017 for in-depth historical discussion). Interviewees talked about how this historical legacy shapes the interactions between the local community and DEP and has also permeated within the community between long-time and more recent residents. Interviewees discussed the lack of recognition of this history by DEP as a key factor in this conflict. Our document analysis supports this perspective with few, if any, of the publicly available documents explicitly referencing this history and its subsequent tension.

Interviewees also discussed the more recent history of litigation between New York City and watershed communities, specifically referencing a significant power differential. This power differential was discussed as a function of the difference in financial resources available and the role New York City plays as a

significant landowner in the community. Interviewees identified New York City's seemingly endless ability to engage in litigation as a barrier to local communities' holding the DEP accountable for the impacts of their programming.

Additionally, our analysis highlighted the potential for broader pre-existing equity issues to significantly influence the impacts and processes of buyout programs. While each buyout decision is unique and property specific, the potential cascading impacts of such buyouts are deeply influenced by insecurities around housing, food and healthcare that plague rural communities across the country. These pre-existing issues are very salient to the community at the center of this case study, making each property buyout that much more contentious and potentially damaging.

Recommendations

Based on the findings above, we provide several recommendations for the buyout program in question, as well as for buyout programs more broadly to serve as effective tools for climate adaptation. We provide these recommendations as suggestions for consideration and believe they can facilitate fruitful and necessary discussion into how the NYCFFBO can equitably prioritize the well-being and resilience of watershed communities. We have categorized these recommendations into the themes of program design, program evaluation and further program investigation.

Program design

Recommendation 1: Invest more resources into comprehensive planning

We recommend increasing program funding to support comprehensive planning efforts in eligible communities. This should include direct investment in local community technical and personnel-related capacities to plan holistically around the buyouts. These planning efforts should directly address and consider not only how the buyout program influences community flood resilience, but also how it influences the overall resilience of the community to multiple stressors. These 'broader resilience' considerations should include impacts to essential services, housing availability, and the social fabric of the community. Proactively planning for the inevitable influence of buyouts to these areas of the community can lessen adverse impacts, gain community trust and improve long-term resilience to both environmental and socio-economic threats.

Recommendation 2: Increase investment in local technical capacities

Our results show that current trust in local technical experts is one of the most well-perceived aspects of the buyout program. The program should continue to invest in local technical expertise and increase the capacity of local experts to expedite the buyout process. These individuals serve as important information brokers, both explaining important technical details to community members and providing important local knowledge to the DEP.

Recommendation 3: Acknowledge complex histories and existing tensions

The longstanding involvement of New York City in these rural communities, and the complex histories and power dynamics at play, have created tensions and hinder the progress of the program. An important initial step in addressing this tension is acknowledging these histories and their influence on present-day relationships. Openly addressing tensions can play an important role in building trust and has the potential to help facilitate greater participation and engagement in planning for buyouts. Acknowledging this historical tension in program overview materials and supporting existing efforts to capture local histories are good entry points for addressing these complex tensions and legacy effects.

Recommendation 4: Include the mitigation of negative general resilience impacts in ‘cost of program’

In addition to systematically planning for the overall community resilience impacts of the buyout program, decision-makers should consider including the mitigation of these impacts within the cost of the buyout program. As discussed above, overall negative resilience impacts from buyouts are inevitable, and redressing these impacts is key to ensuring both community vitality and community support for the buyout program. A critical step to addressing community resilience impacts is tracking how the buyout program affects the community and its residents using an indicator approach, as discussed in more detail below.

Program evaluation

Recommendation 5: Utilize indicators to improve program evaluation

Program evaluation needs to more holistically evaluate the impacts and effects of buyouts on local communities and residents. These enhanced evaluation efforts should employ an indicator approach to measure impacts to flood resilience, overall resilience and process engagement. These indicators should be systematically tracked over time to understand the impact of each buyout on both the individual and the community at large. Additionally, this data should be transparently obtained and made publicly available for maintaining trust. A list of potential indicators is provided in the table below

Table 1. Suggestions for holistic resilience evaluation metrics

Flood resilience indicators	<ul style="list-style-type: none">• Number of individuals who moved out of the floodplain and remain out of the floodplain 5 and 10 years later.
Overall resilience indicators	<ul style="list-style-type: none">• Changes in tax base• Changes to the availability of essential services (healthcare, grocery stores, clinics, etc.)• Changes to the number of available housing units and analyze in the context of local needs and number of affordable units available
Process indicators	<ul style="list-style-type: none">• Would buyout participants make the same decision again?• Did buyout participants feel like they had another option if they did not accept their buyout offer?• Did buyout participants feel like they had all the information needed to make an informed decision?• Did buyout participants feel as if they could trust the information being provided to them by the program facilitator?

Further program investigation

Recommendation 6: Systematically investigate relocation efforts

In addition to collecting data on who relocates within or to outside of the floodplain, the city should systematically investigate these relocation efforts. Gaining insight into 1) when relocation is or is not successful, 2) the circumstances in which relocation funding has been successfully accessed and 3) the factors that lead to relocation success, could help improve the efficacy of relocation efforts. Improving the success of relocation efforts has significant potential to safeguard communities from negative, unintended consequences of the buyout program.

Recommendation 7: Systematically investigate process timelines

Finally, further investigation efforts should focus on timing delays in the buyout process. Specifically, timelines for individual properties should be reviewed to identify process bottlenecks. This information can be used to identify areas of the process that need additional resources or can be adapted and streamlined. Decreasing the length of buyout timelines is a concrete step that can be taken to enhance the positive benefits the buyout program creates.

Conclusion

Climate adaptation provides an opportunity to both protect and improve the social and ecological resilience of communities and their landscapes. Understanding how strategies such as buyouts interact with broader social and economic contexts is critical for facilitating adaptation that fosters more resilient and socially just futures. The NYCFFBO is a critical program that helps move people and property out of harm's way and simultaneously protects the drinking water for millions of New York City residents. However, without more explicitly considering equity issues, the NYCFFBO can also reinforce the widespread neglect of the complex needs of rural communities in this country and can exacerbate the detrimental social and economic challenges they face. By continuously working to center equity and the well-being of rural communities as cornerstones of the program, the NYCFFBO has the opportunity to further harness potential benefits and mitigate negative impacts of the program. Further, these lessons learned go beyond that of NYCFFBO and can help guide the design and evaluation of buyout programs more broadly.



STUDY 3: MENTAL MODELLING LOCAL LEADERS' PERCEPTIONS

DOES INCREASING FLOODPLAIN PROTECTIONS IMPACT AFFORDABLE HOUSING?

Study Purpose

In addition to our review of the literature, and a case study focused on buyouts, we also conducted a case study on floodplain protections and their potential influence on affordable housing in the Catskills region of New York State. Affordable housing is one of the most pressing issues local governments face across the United States, and is also a social equity issue fundamentally connected to land use planning decisions (Sze & London, 2008). In the early phases of this broader project, we conducted key informant interviews with both community leaders and TNC climate adaptation practitioners from across New York. Many of these interviewees highlighted concerns by local decision makers and community members of a perceived causal relationship between floodplain protections and affordable housing. As a result, the focus of this study is centered around exploring this relationship at a local scale in a single county in the Catskills region. This case study provides another 'on the ground' example of the potential interaction between equity and nature-based flood adaptation.

Affordable housing is a challenge facing local leaders in communities all around the United States. Nearly half of all renting households in the U.S. spend more than 30% of their income on housing costs (Airgood-Obrycki et al., 2022). As of March 2023, experts estimate monthly payments required to purchase a median priced home have reached \$3,000 (Joint Center for Housing Studies of Harvard University, 2023). Simultaneously, the impact of climate change hazards has risen drastically, costing more than 2.57 trillion dollars in natural disaster associated damages since 1980 (NOAA, 2023). One of the most recognized ways these two issues are related is the impact of climate hazards on the livability and safety of residential areas (due to wildfire, flooding, extreme heat. etc.). While NbS can help residential areas adapt to these threats, these strategies may also exacerbate or interact with equity issues, including the housing crisis. Therefore, it is important to better understand the potential mechanisms and community-level factors that may make a community more vulnerable to an adverse interaction between their floodplain protection programs and housing availability and affordability. To achieve such an understanding, this study investigates the perspectives of local decision-makers and outlines their cognitive models of if and how floodplain protections and affordable housing interact.

Floodplain protections as a NbS for adaptation to flooding

We consider floodplain protections to include a "variety of land planning tools to prevent development and protect intact floodplains" (Walker et al., 2022, pp 149). These tools can include policies, bylaws and other forms of regulations. In this study, we are focused on local level floodplain protections (i.e., county level or

or smaller) in a U.S. context. Historically, floodplain protections have been used as strategies for wetland conservation, water quality protections and damage prevention in areas that historically flood (Federal Interagency Floodplain Management Task Force, 1994). With increasing precipitation and subsequent flooding impacts due to climate change, floodplain protections are now being used as an adaptation strategy in both riverine and coastal communities (Olsen, 2006). In their flood adaptation hierarchy, Peck et al., (2022) highlight the protection of natural floodplains as an important priority for flood adaptation, arguing that this should be our first priority for keeping people and infrastructure out of harm's way and highlighting the low cost-benefit analysis of investing in floodplain protections.

Affordable housing in New York Communities

Adapting to climate change, and flooding specifically, is just one of the many priorities local leaders have to juggle as they make decisions about allocating municipal time and resources to increase community resilience. Affordable housing is one such issue. Since 2013, New York City rent prices have increased 30% while areas outside of NYC have seen rent increases between 40 and 60% and some rural communities have seen home prices rise as much as 80% (New York State, 2023). Experts underscore that the housing crisis across the U.S. is not a new problem, but one that low to moderate income households and communities of color have been experiencing for multiple decades (Saval et al., 2021). Yet, it is a problem that has been significantly exacerbated by the COVID-19 pandemic (Li & Zhang, 2021). This is particularly true for the 'bedroom' communities of NYC, which saw massive in-migration of people exiting New York City during the heights of the pandemic, as well as an increase in short term rentals and second homes. Ulster county, a county in the Catskills region, experienced a median house price of \$349,000 in 2022, up from \$100,000 in 2019 (US Census, 2020).

From a research perspective, we have very little understanding of how floodplain protections and housing affordability interact with one another. There are strong perceptions (particularly within the real estate industry) that environmental regulations negatively impact housing affordability, however, these perceptions have not been substantiated by the existing literature (Quigley & Rosenthal, 2005). Scientific inquiry into these connections has been challenged by a lack of available data and difficulty in quantifying the effect of a regulation or program on a specific housing development (Laquatra & Potter, 2000). However, the existing studies seem to support the notion that the relationship between these issues is nuanced and complex, and that a clear causal interaction is not evident. One study of local wetlands regulations in New York towns concluded that the regulations analyzed did not appear to limit housing density, and may in fact encourage denser housing development in areas outside of regulatory buffer zones (Siders et al., 2021). Similarly, in Massachusetts, an analysis of local wetlands bylaws found that the potential reduction in housing supply was possibly mitigated by shifting development locations within communities to areas further from wetlands after bylaws were passed. This study did find that home prices increased in communities where their neighboring communities recently enacted bylaws (Sims & Schuetz, 2009). Finally, several studies have concluded that rising housing prices are more influenced by changing demographic and density trends than by environmental regulations (Glaeser & Ward, 2009; Laquatra & Potter, 2000). However, much of this existing literature is focused on broad environmental regulations and is not specific to floodplain protections.

Armed with little science-based evidence to support decision-making but extensive place-based expertise, local leaders are attempting to navigate heightened pressures to address both housing affordability and flood risk in their communities. The purpose of this study is to explore the conceptual models local decision makers (e.g., elected leaders, municipal planners, floodplain managers) have about how floodplain protections impact affordable housing. The broad questions that guide this research are: 1) how do local decision makers conceptualize the relationship between floodplain protections and housing affordability, and 2) do local planning efforts and land use regulations recognize a connection? We synthesize these conceptual models to discuss implications for how adaptation practitioners can support local decision makers as they navigate these contentious and critical issues, as well as to set priorities for further research.

Case Study

Our study focused on a county in the Catskills region of New York State. The Catskills are an important context for studying the intersection of floodplain protections and housing. The region's proximity to New York City (~100 miles) and significant recreation industry means that it is a frequent destination for New York City residents to travel for vacations and to purchase second homes, both of which have impacts on local housing markets. Within the last 5 years, many of the local governments in the region have established short term rental laws to help address these impacts.

In addition to housing challenges, parts of the Catskills experience both riverine and coastal flooding due to steep mountainous topography and storm surge flooding in the Hudson River. Significant efforts are currently being made across the Catskills to increase the flood resilience of both rural and urban communities.

We focused our case study on a single County within this region (we will refrain from naming the county to protect the anonymity of our participants), but strategically focused our data collection around a few specific municipalities within the selected County. These municipalities include a small city (~ 3,000 people per square mile), two semi-urban towns (~ 300-500 people per square mile) and one rural township (~25 people per square mile).

Methods

To investigate how local decision makers and local planning efforts conceptualize the relationship between floodplain protections and housing affordability, we relied on a combination of mental model interviews and public document analysis.

Mental Models

Mental models are "a concentrated, personally constructed, internal conception of external phenomena or experience that affects how a person acts" (Rook, 2013, p. 45). Mental models are used to make sense of and navigate complex issues (Carley & Palmquist, 1992). Mental models can be elicited from people in a variety of ways, but often include some sort of interview in which an individual is prompted to reflect on and explain how they think about an issue, the variables or factors that are relevant to the context and how those variables may influence one another. Mental models have been used repeatedly in environmental systems to understand how stakeholders think about complex problems. We believe that mental models have the potential to be a useful tool to unpack the multiple factors at play in any interaction between an adaptation strategy and social equity issue.

In this study, we conducted 15 mental model interviews between November 2022 and January 2023. In these interviews, we asked participants to articulate whether they saw a link between housing affordability and floodplain protections, to describe any such relationship, and explain what factors influence this relationship using examples from their local community as evidence. Participants had one of four types of roles within their municipalities: (1) elected officials (mayor, supervisor, town board etc.), (2) planners, (3) housing specialists and (4) environmental specialists. We then created conceptual diagrams from the transcripts of the interviews, illustrating the factors participants identified that influenced the relationship between floodplain protections and housing affordability and the linkages between these factors (see Fig 4 for an example of a participant's individual mental model). Next, we created a list of factors that multiple participants mentioned and recorded the frequencies and the linkages between different factors, in order to combine the individual mental models into a single model.

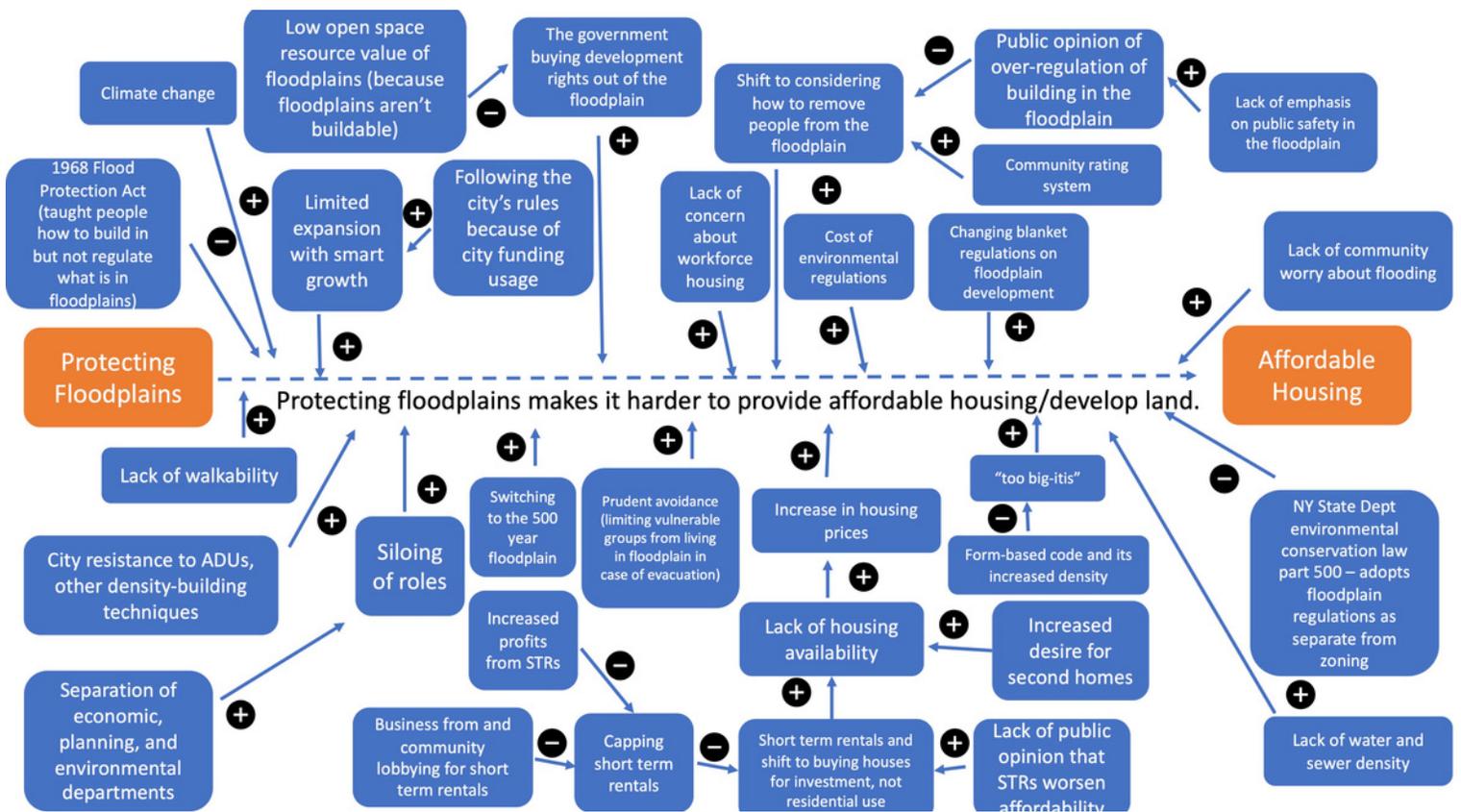


Figure 4. Example of individual mental model

Planning Document Collection and Analysis

In addition to the mental model interviews, we also conducted an analysis of online publicly available documents specific to land use planning in the case study community. These documents were found on local government websites and fell broadly into the categories of land use plans (comprehensive community plans, open space plans etc.), meeting minutes, zoning or bylaw regulations, analyses & reports and press releases. The document search resulted in 45 documents. Each document was reviewed twice, and on second review, text was coded for any discussion of housing affordability or floodplain protections efforts.

Results

Mental Models

Data from all 15 mental models were combined to create a 'collective' mental model (see Figure 5), which included 27 unique factors identified by at least two of the participants. An upcoming peer-reviewed publication details these unique factors and the differences in participant mental models, but Figure 5 illustrates which factors were frequently highlighted (area of mental model congruence) and which factors were unique to a handful of the mental models (area of incongruence).



Figure 5. Collective mental model illustration. Color schemes denotes what percent of participants identified each factor

Planning Document Analysis Results

Most planning documents discussed strategies for protecting floodplains and addressing affordable housing challenges, but generally discussed these topics in isolation from one another. Sixteen of the 36 documents addressed both affordable housing and floodplain protections directly in relation to one another. This connection was often made in comprehensive planning documents or plans and reports specific to hazard mitigation. Further, most connections were made in county wide plans or city specific plans. Documents for the selected semi-urban and rural communities rarely made an explicit connection between affordable housing and floodplain protections

When documents did make an explicit connection, it was done in one of three ways. First, some documents highlighted the potential spatial overlap of floodplains and planned affordable housing developments as rationales for effective floodplain protections and comprehensive planning efforts, more broadly. In a related, but second approach, some documents discussed the connection between floodplain protections and affordable housing directly in the goals of the plan or policy being discussed. For example, one comprehensive land use plan articulated “providing safe and climate resilient housing” as a key goal of the local development efforts. Regulating development in floodplains was listed as one potential strategy for achieving this goal.

The third way in which documents discussed a potential connection between housing and floodplains was in the explicit reference of perceived tension between simultaneously meeting current housing needs and future housing needs. This was framed as the trade-off associated with developing available land to provide affordable housing stock more rapidly versus preventing development in places that will be at increased risk for flooding in the future. Notably, these plans often mentioned resistance to floodplain protections from developers as evidence of this tension. To mitigate this tension, some documents discussed strategies such as highlighting the recreation value of floodplain protections and the need for green spaces in all types of housing developments.

Recommendations

The data from this study does not provide empirical evidence for supporting a causal link between increasing floodplain protections and decreased affordable housing in our case study communities. However, the study does provide evidence that this connection is salient to local decision-makers and is therefore a potential consideration as they make decisions that impact both the flood resilience and housing security of their communities. As a result, the influencing factors highlighted in the mental modelling and document analysis point to system components that could be considered when trying to understand potential equity impacts of efforts to protect floodplains.

Based on these findings we provide the following recommendations for practitioners working to protect floodplains.

Recommendation 1: Communicate the complexity of the relationship between floodplains and housing with local leaders.

- Underscore the importance of thinking about affordable housing in tandem with floodplain protections when working with leaders to mitigate flood risk. Our data suggests that local leaders are clearly thinking about this potential connection. Climate adaptation practitioners have the potential to play an important role in helping local leaders navigate these tensions, but only if the issue is discussed with nuance and complexity.
 - Use the factors highlighted in the mental map data to guide your discussion about how floodplain protections impact affordable housing. Table 2 provides an example of how some of these factors could be used in discussion with local leaders about how floodplain protections may or may not impact housing in their communities .

Table 2. Examples of how mental map factors can guide more nuanced conversations with local leaders about a potential floodplain protection-housing interaction.

Factor	Example Discussions Points
Local zoning regulations	<ul style="list-style-type: none"> • What local zoning regulations are impacting how development occurs in the floodplain? • Are there zoning regulations in areas outside the floodplain impacting the housing development pressure within the floodplain? If so, how? • How would changing zoning regulations impact development pressures in the floodplain?
Community values and perceptions	<ul style="list-style-type: none"> • How would you describe the flood risk perception of your community? • How would you describe your community's perception of affordable housing developments? • How do these two sets of values or perceptions influence: • Where and how floodplain protections are regulated and where and how affordable housing is developed?
Location of Undeveloped Land	<ul style="list-style-type: none"> • What percentage of your community's undeveloped land is in the floodplain? • Outside of the floodplain implications, is the land developable, or of interest to developers?
Community Socio-Economic Status	<ul style="list-style-type: none"> • What social groups in your community are most impacted by affordable housing challenges? If the problem is exacerbated, are the effects inequitably distributed? • What social groups are most likely to migrate to future developments in the floodplains? Who does that make more vulnerable to flooding impacts?
Presence of water and sewer infrastructure	<ul style="list-style-type: none"> • Does the land in the floodplain have access to sewer or water infrastructure? If not, how many houses could be built, at what price range, and would it have a sizable effect on the housing market? • Could supporting the sewer or water infrastructure of areas not in the floodplain increase the ability to support denser development and therefore take pressure off floodplain lands?

Recommendation 2: Support comprehensive planning.

- Integrated planning provides the opportunity to maximize potential benefits and minimize risks of floodplain protections to affordable housing. Ensure that you have both floodplain and housing specialists involved in this process. Further analysis of this data points to significant differences in the mental models of these various experts.

Recommendation 2: Support comprehensive planning.

- Integrated planning provides the opportunity to maximize potential benefits and minimize risks of floodplain protections to affordable housing. Ensure that you have both floodplain and housing specialists involved in this process. Further analysis of this data points to significant differences in the mental models of these various experts

Recommendation 3: Consider community perceptions and zoning codes

- Both factors were highlighted by nearly 75% of participants as important influences of the relationship between floodplains protections and housing affordability. These factors may be important levers to pull to mitigate any potential negative impacts that floodplain protection may have on affordable housing

Recommendation 4: Collaborate on collecting more evidence.

- Relationships between local governments, climate adaptation specialists and researchers are needed to understand the nuance and context specificity that underlies any relationship between housing and floodplain protections. These types of collaborative partnerships are crucial in better understanding how and when floodplain protections can benefit local housing goals rather than detract from them. Specifically, future research could explore the cascading impacts of zoning changes or the correlation between community risk perceptions and perceptions of affordable housing projects.

Conclusion

More research needs to be done before any broad statement can be made about a causal relationship between floodplain protections and housing affordability. However, the data from this study suggests that the potential of such a relationship is salient to how local leaders conceptualize these issues in the context of their communities. Further, the data point to factors that should be considered and discussed when navigating any tension between housing and flooding adaptation advocates. This study underscores the need for context specific data to support adaptation practitioners working to increase the climate and social resilience of local communities.

AN EQUITY LENS ON ADAPTATION:

A GUIDE FOR DESIGNING MORE EFFECTIVE, EQUITABLE, AND JUST CLIMATE ADAPTATION STRATEGIES

Guide Purpose & Overview

The impacts of climate change – including worsening heat waves, storms, sea level rise, drought and wildfire – are posing an increasing risk to communities across the globe. As a result, scientists, policymakers and other decision-makers are prioritizing climate adaptation strategies that will allow communities to become more resilient to these impacts and coexist with the reality of climate change. As these strategies are designed and implemented, the interactions between climate adaptation and social inequities, and the need to center equity considerations in climate adaptation, are being increasingly recognized. **The purpose of this guide is to provide adaptation practitioners with a conceptual framing for how to proactively identify the equity implications of their work and take initial steps to address them.** This guide includes a practical and thorough explanation of our framework, the process of how we developed the framework and an opportunity to apply the framework through U.S.-based case studies with a focus on flooding.

Who should read this guide?

Our guide is aimed at adaptation practitioners working in U.S contexts. However, anyone that is looking to better understand and articulate the nuanced intersection between equity and climate adaptation should keep reading!

Introduction to the framework

Our framework is based on an understanding of the interaction between social equity and climate change and is grounded in the following realities:

1. Climate change and climate adaptation strategies **do not exist in isolation** and are affected by the same injustices and inequities that shape the rest of society
2. Adaptation strategies can interact with social equities to **produce and exacerbate inequity**
3. Understanding this interaction and building it into planning will lead to **more equitable and effective adaptation strategies**

We also know that the risks posed by climate change, social inequities and the interactions between the two, will differ from community to community (Walker et al., in press). Further, we know that equity indicators are becoming more commonly used in adaptation planning, but there is a lack of consistency in these indicators and how they are applied (Coggins et al., 2021; Swanson, 2021). Therefore, there is a need for a community-centered and place-based approach to equitable climate change adaptation planning that is also grounded in a consistent framework. We understand that this process takes time, and that there is no “one size fits all” approach to doing this work.

We developed our framework with all of this in mind, and believe that regardless of your specific context, these lessons learned will provide helpful signposts for wading through the messy and challenging work of designing and facilitating equitable climate adaptation.

Research Process: What informed our framework?

Our framework is informed by a two-pronged research approach. First, to understand what the existing science tells us about the relationship between climate adaptation and equity, we conducted a scoping review of the scientific literature. Through an extensive screening process of thousands of peer-reviewed journal articles, we identified 316 studies that focus on the equity implications of climate adaptation strategies. We extracted data from each study to create an overall picture of the state of climate change adaptation and equity research and practice. Specifically, we learned what climate hazards and social identities are most commonly focused on, the temporal trends in climate adaptation and equity literature and what geographies have benefited from the most attention related to these topics (see full results of the [scoping review here](#)). We also learned that scholars are defining and conceptualizing the terms justice and equity in a multitude of ways that lack clarity and consistency. Our framework applies these findings to develop a strategy for defining and conceptualizing equity across contexts in a consistent way. While the literature uses both terms justice and equity, we will use the term equity in this guide. For a more detailed explanation see the note about terminology in the introduction of the report.

The second component of our research involved two community case studies in rural upstate New York. These communities face significant risks from flooding and are grappling with existing social vulnerabilities and inequities. Through an analysis of relevant policy documents and interviews with key informants and other community stakeholders, we developed an understanding of the interactions between climate risk and social inequities in these communities, and the ways in which community leaders understand these interactions. One town we worked with is also a participant in a managed retreat (or “buyout”) program organized by the state government, allowing us to gain an on-the-ground understanding of how a real climate adaptation program is interacting with equity issues at a local scale. We outline our framework, expand on both of these case studies and apply our framework to them in the following sections.

Our Framework: What steps should be taken to conduct an equity analysis?

Our framework for equitable climate adaptation planning involves a three-step process. First, gain a clear understanding of the four components common in definitions of equity: the actors affected, the scale of the issue, the pathways of the equity issue, and the principles used as criteria for equity (see Figure 6). Second, use the four components to identify possible equity concerns. Using these components as a lens to understand the equity implications of climate adaptation projects allows for consistency and comparability in how we think about the interaction between adaptation and equity. Third, brainstorm alterations to your adaptation plan, using the four framework components as a criteria for what equitable adaptation can look like. Each of these steps is discussed in more detail below.

Step One: Learn about the components of the framework

Figure 6. Components of equity analysis framework



Affected actors refers to the group or groups of people affected by an equity issue. When developing climate adaptation programs, policies or strategies, it is vital to consider who might be adversely or beneficially impacted by this work. Common social identities to consider include socio-economic status, gender, race and ethnicity, sexual orientation, age, nationality, disability or English language proficiency. In addition to a wide range of social identities, other factors such as tenure in the community or status as a renter vs. homeowner may be of relevance.

Scale of issue refers to the spatial and governance scale relevant to the equity issue. Adaptation planners should ask themselves what scales are important to consider for the plan or project, and what the equity implications might be at those scales (i.e., the scale of an ecosystem, or political boundary).

Pathways refer to the different ways in which equity issues materialize in adaptation work. Pathways provide a 'lens' for identifying equity issues. Distributive, procedural, recognitional and structural equity are examples of pathways. Distributive equity refers to the difference in risks, costs and benefits of climate adaptation experienced by affected actors; it acknowledges that the distribution of these 'goods' and 'bads' occurs simultaneously and is interconnected. Procedural equity refers to meaningful involvement of the various actors in decision-making processes. Recognitional equity references the valuing of experiences, perspectives, knowledge and well-being of affected actors. Structural equity (also sometimes called contextual) references the ways in which historical, systemic and pre-existing inequities shape or exacerbate other equity or justice issues (Grasso, 2010; McDermott et al., 2013; Schlosberg, 2004). When conducting an equity analysis, it is important to consider what the distributive, procedural, recognitional and structural equity issues are for your project context. Figure 6 summarizes these pathways.

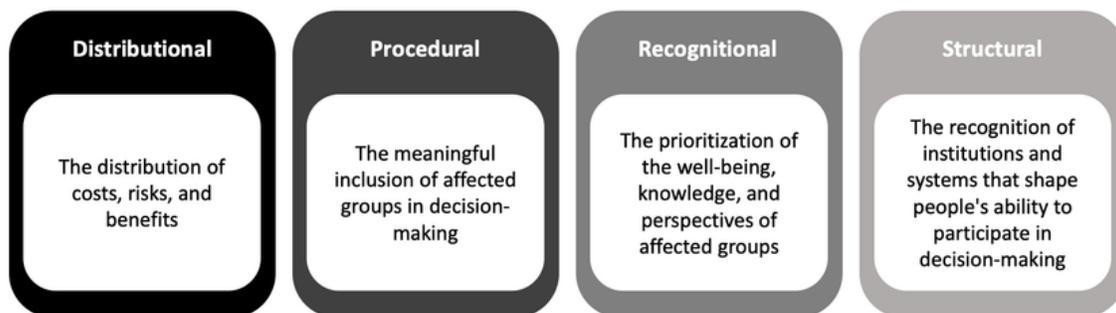


Figure 7. Summary of equity pathways

Principles refer to the criteria used to evaluate whether equity was achieved. For example, a pathway lens can guide an equity analysis to focus on the disproportionate amount of adaptation burdens a social group might experience (distributive equity) but a principle lens helps determine how to evaluate what is considered a 'disproportionate amount.' Any criterion used to answer this question is normative in nature and includes a multitude of options. Here, we highlight five principles: needs-based, egalitarian, rights-based, capabilities and corrective. A needs-based principle argues that we should be concerned with prioritizing the needs of the most vulnerable, while an egalitarian principle argues for equal division of resources and processes.

A rights-based principle advocates for a common ‘threshold’ of rights that all groups and individuals should have. A capabilities principle argues for ensuring everyone can live the life they value. Finally, a corrective principle focuses on historical responsibility and current capacity as criteria for who should pay the costs of equitable or just climate adaptation. Adaptation planners and practitioners should select a principle or principles that will be used to determine if the project is equitable, and consider this principle throughout planning, implementation and evaluation. The table below identifies these common principles and provides citations for further reading.

Table 3. Summary of equity principles

Principle	Description	Reference
Needs-based	Prioritizing the needs of the most vulnerable	Holtug, 2009
Egalitarian	Equal division of resources and processes	Holtug, 2009
Rights-based	Reaching a common ‘threshold’ of rights that all groups and individuals should have	Tschakert & Machado, 2012
Capabilities	A more abstract but widely referenced argument for ensuring everyone can live the life they value	Nussbaum, 2003
Corrective	Uses historical responsibility and current capacity as criteria for who should pay costs	Alder, 2007

Step Two: Use the framework components to identify any potential equity implications in the adaptation project

Once you understand the four components outlined above, take some time to consider how they apply to your project and community context. This process may take increased engagement with the community and partnership with local organizations in order to fully understand any existing equity issues and how the climate adaptation project might influence or interact with these issues. Table 4 provides specific prompts to guide your reflection and discussion as you attempt to apply each of the components to your specific project or component.

- Step 2A** Bound your analysis by **actors** and **scale**
- Step 2B** Identify how equity issues might materialize, using the four pathways to guide your response
- Step 2C** Determine how you will evaluate if equity has been met, using the four **principles** to guide your response
- Step 2D** Use your chosen **principles** and **pathways** to identify equity concerns. The table below provides sample questions that can be used to help you identify potential equity concerns

Table 4. Prompts to guide discussion and reflection during step 2

<p>Affected Actors</p>	<p>Questions to consider:</p> <ul style="list-style-type: none"> • Who are the groups of people that might be impacted by the climate adaptation strategy? <p>Potential Actor groups to consider:</p> <ul style="list-style-type: none"> • Socio-economic status • Gender • Race and ethnicity • Disability • English language proficiency • Age • Tenure in community • Housing status
<p>Scale of Issue</p>	<p>Questions to consider:</p> <ul style="list-style-type: none"> • What spatial and political scales do we need to consider? • What might the potential implications be at these scales? <p>Scales to consider:</p> <ul style="list-style-type: none"> • Individual property owners/renters • Neighborhood • City/town • Watershed, fire district, ecosystem boundary
<p>Pathway(s)</p>	<p>Questions to consider:</p> <ul style="list-style-type: none"> • What are the different ways equity issues may materialize in adaptation efforts? <p>Pathways to consider:</p> <ul style="list-style-type: none"> • Distributional: What is the distribution of harms, risks, and benefits? • Procedural: Who is being meaningfully involved in the decision-making process? • Recognitional: Who is the program or project designed to benefit? What are potential trade-offs and tensions? • Structural: What pre-existing histories and contexts shape people’s experience with adaptation?
<p>Principle(s)</p>	<p>Question to consider:</p> <ul style="list-style-type: none"> • How would you know when something is equitable? • How can we make our assessment of equitable planning as objective as possible? <p>Principles to consider:</p> <ul style="list-style-type: none"> • Egalitarian: Are risks and benefits evenly distributed? • Needs-based: Are resources prioritized to the places that need them the most? • Rights-based: Do we meet a standard of rights, where regardless of resources we meet a certain threshold for everyone? • Corrective: Are we trying to right prior wrongs? • Capabilities: Does our work ensure that people have the autonomy to live their lives in ways that are meaningful to them?

Step 3: Brainstorm strategies for addressing specific concerns

In order to effectively come up with more equitable adaptation solutions, you first need to be able to articulate the results of your equity analysis with clarity. Try to summarize the results of your Step 2 analysis in a few sentences. Next use this description to guide your brainstorming of potential changes to your project plan. We recommend using the principle you have chosen as a key guide in this brainstorming. What would it look like for the actors involved in your work to be equitably engaged in all four pathways, using your chosen principle as the goal? Finally, you should work through this analysis with your project partners and affected actors.

- Step 3A** Summarize the results of Step 2 in a few sentences. How would you describe the equity implications to someone else?
- Step 3B** Make a list of potential changes to your adaptation project or plan that would address the potential equity implications
- Step 3C** Use the content you've created from this process to facilitate discussions with your project partners and affected actors to ensure your adaptation work is equitable

Important Note

This framework is not designed to be a one-step solution for making your adaptation work equitable. Rather this guide is a tool to help you gain conceptual clarity so that you can more clearly communicate and collaborate with project partners to mitigate any potential inequities associated with your adaptation work. **This was not designed as a replacement for engaging with the affected actors.** In fact, we recommend doing this level of equity analysis with the affected actors and project partners. However, working through some of these concepts on your own is an important step in preparing yourself to meaningfully engage and facilitate these conversations.

Case Study Example

Here we provide an example of how the framework could be applied to conduct an equity analysis of a climate adaptation case study. The following section provides the background of our case study, guided prompts to help you work through the framework using the case study and the answers our team came up with for each prompt and component of the framework.

The Case Study Overview: Flood Buyouts in the Catskills, NY

The case study community is a rural municipality in the Catskills region of New York State (approximately 100 miles from New York City). The community participates in managed retreat or “buyout” program organized by the New York City Department of Environmental Protection (NYC DEP). Buyout programs, like this one, involve the government purchasing floodplain properties as a method of incentivizing people to move away from high-risk areas. Past research has explored the economic impacts of buyout programs, but there is a gap in investigating the equity and social implications of buyout programs, especially in rural communities.

The NYC DEP buyout program was instigated after Hurricane Irene led to severe flooding in Catskill watershed communities in 2011. The program was created as part of a larger program focused on maintaining and improving the water quality in the region, as it is one of the primary sources for drinking water for New York City. As a result, the buyout program was designed to both protect homeowners living in at-risk areas in the Catskills and to safeguard the water supply for New York City. Watershed towns, such as our case study community, that meet certain criteria can opt in to participate in the program. For participating communities, NYC DEP will buy flood risk properties at their pre-flood damage price and will provide some funding for relocation.

Our case study community has experienced significant damages from multiple flood events over the past decade. There is also a history of tensions between the community and New York City and NYC DEP. Eminent domain was used to build a reservoir in the community to serve New York City’s water supply and NYC DEP is one of the largest landowners in the community. Local decision-makers were heavily involved in the design of the buyout program, but the decision for the town to participate was still very contentious within the community. Many of the properties in the community that are eligible for or have received a buyout are commercial properties, including essential services such as a grocery store, healthcare clinic and fire station, prompting concerns about how the program might impact access to these services.

Apply the Framework

Use the following table to reflect on how the various components of the framework apply to this case study, and then brainstorm some possible changes to the buyout program that could make it a more equitable adaptation strategy. Use the information from the case study overview to try and answer each of the prompts.

Table 5. Prompts to guide reflection on how the framework applies to the buyout case study (from step 2 of the guide)

Affected Actors	<p>Questions to consider:</p> <ul style="list-style-type: none"> • Who are the groups of people that might be impacted by the buyout program? • Impacted by program benefits? • Impacted by program consequences? • Impacted indirectly vs directly? • Are there subgroups within the actor groups you’re mentioning?
Scale of Issue	<p>Questions to consider:</p> <ul style="list-style-type: none"> • What spatial and political scales are relevant for the buyout program? • What might be the potential implications of prioritizing one of these scales over the other? <p>Scales to consider:</p> <ul style="list-style-type: none"> • Individual property owners/renters • Neighborhood • City/town • Watershed, fire district, ecosystem boundary

<p style="text-align: center;">Pathway(s)</p>	<p>Questions to consider:</p> <ul style="list-style-type: none"> • What are the different ways equity issues may materialize in the buyout program? <p>Pathways to consider:</p> <ul style="list-style-type: none"> • <i>Distributional</i>: What is the distribution of harms, risks, and benefits associated with the buyouts, and who do they affect? • <i>Procedural</i>: Who is being meaningfully involved in the decision-making process of when, where and how buyouts happen? • <i>Recognitional</i>: Who is the buyout program or project designed to benefit? If there are multiple priorities - are potential tradeoffs and tensions between priorities? • <i>Structural</i>: What pre-existing histories and contexts shape people's experience and engagement with the buyout program?
<p style="text-align: center;">Principle(s)</p>	<p>Questions to consider:</p> <ul style="list-style-type: none"> • How would you know when a buyout is equitable something is equitable? • What criteria should be used to 'measure' or 'determine' whether something is equitable? <p>Moral principles to consider:</p> <ul style="list-style-type: none"> • <i>Egalitarian</i>: Are the costs and benefits evenly distributed across the affected actors groups? • <i>Needs-based</i>: Is the program prioritizing the people and places with the highest needs? • <i>Rights-based</i>: Do we meet a standard of rights, where regardless of resources we meet a certain threshold for everyone? • <i>Corrective</i>: Are we trying to right prior wrongs? • <i>Capabilities</i>: Does our work ensure that people have the autonomy to live their lives in ways that are meaningful to them?

Based on your answers to prompts above, make a list of the potential suggestions you would make to design an equitable buyout program for this case study context.

Potential Answers

Our team conducted an equity evaluation of this buyout program. Using the data from our work with the community, we applied the framework components and came up with following recommendations for a more equitable buyout program.

Table 6. Prompts to guide reflection on how the framework applies to the buyout case study (from step 2 of the guide)

Affected Actors
<ul style="list-style-type: none">• Residents in the community...<ul style="list-style-type: none">◦ Who live in the floodplain and who qualify for a buyout◦ Who live in the region and experience flooding, but don't qualify for a buyout◦ Who don't experience flooding but are affected by the loss of properties and infrastructure from buyouts◦ Low income residents who are more vulnerable to basic needs and have concerns about access to essential services◦ The elderly or residents who have health challenges Long term residents vs newer residents• Local leaders who facilitate the program<ul style="list-style-type: none">◦ Elected and non-elected• NYC government and the relevant agencies or departments• Residents of NYC• Nearby watershed communities who also participate in the buyout programming• New York State Government• Environmental Protection Agency (regulates NYC drinking water system)

Scale of Issue
<ul style="list-style-type: none">• Watershed or sub watershed scale<ul style="list-style-type: none">◦ Implications: The spatial distribution of buyout properties may appear dispersed at the watershed scale, but could be disproportionate within sub watersheds• 100-year vs 500-year floodplain<ul style="list-style-type: none">◦ Implications: Relies on accuracy and availability of flood maps and prioritizes present or future flood resilience• Village or town municipal boundaries vs County boundaries<ul style="list-style-type: none">◦ Implications: People who are members of the 'community' and experience flooding can be left out because they live just outside the political boundary that receives funding for the program.

Pathway(s)

Distributional pathway: What are the impacts of the program and who do they affect?

- The program **directly supports community members** who are living or working within the floodplain and helps get these people out of financial stress due to flood damage or high flood insurance premiums.
- The program **directly benefits the NYC government and indirectly benefits NYC residents** through a cost-effective strategy of supplying clean drinking water.
- The program **threatens access to essential services** for community members since it buys out these business properties and does not provide adequate support for relocation.
- Similarly, the program **threatens community cohesion and vitality** by buying out residential properties and pushing community members out of the small township due to the lack of relocation options within the community.
- These **impacts affect residents unevenly**. We found that longer-term residents were more threatened and upset by the loss of community cohesion and vitality. Older residents and low-income residents are most significantly affected by the loss of essential services due to the challenges they face traveling further outside of the community to access these services.

Participant Quote

"They're pushing out the most essential service to hundreds of square miles here. I mean, it's really, it's a huge area with no doctor. It's really big. Because we had people from X,Y, and Z counties, we had people from far away coming here."

Procedural Pathway: Who is being meaningfully involved in the decision-making process?

- Buyout program processes **tried to prioritize local decision-making power** but failed to consider many of the complexities of community engagement and the power dynamics at play.
- There was early community engagement but a **lack of comprehensive planning** and a feeling among participants that engagement opportunities were superficial and limited.
- The lack of other options for residents who rejected a buyout offer prompted reflection among community members into whether the buyout program is providing a truly voluntary, long-term solution for the community, or if it is just the best out of a set of bad options. If there is no viable alternative choice does the community really have **decision-making power**?

Participant Quote

"What my ancestors and the communities went through...And then to have it happening in real time. It was just really weird...it felt like it was all over happening again"

Recognitional Pathway: Who is the buyout program or project designed to benefit?

- The **history of eminent domain** and forced relocation in the watershed has caused tensions between residents and NYC DEP, and these tensions were not acknowledged by DEP in program planning and engagement.
- The role of New York City as a significant landowner in the community, and the recent history of litigation between New York City and watershed communities, creates a sizeable **power differential** between the two groups.
- The potential cascading impacts of buyouts are influenced by **pre-existing equity issues experienced b rural communities** across the country – including insecurities around housing, food, transportation, and healthcare. These issues are very salient to the community at the center of this case study, making each property buyout that much more contentious and potentially damaging.

Participant Quote

“When you start to see and weigh the benefits of community assets versus personal loss and personal tragedy, that becomes a very difficult and devastating decision.”

Structural Pathway: What pre-existing histories and contexts shape people’s experience and engagement with the buyout program?

- **Tensions exist between program priorities** and who is prioritized– are the buyouts primarily about flood risk reduction for water quality or for rural community resilience and well-being? Do we care more about the needs of the individual property owners or the community at large?
- There is a **need for an evaluation of the impact** of the buyouts on the community, not just an evaluation of water quality metrics.

Participant Quote

“When you start to see and weigh the benefits of community assets versus personal loss and personal tragedy, that becomes a very difficult and devastating decision.”

Principle(s)

In our equity analysis, our group chose to apply the needs-based criteria, as it best matches the EPA standard for environmental justice. However, we provide examples of how each of the principles might guide an equity analysis of this case study.

- *Egalitarian:* Are the costs of the programs (tax dollars to fund the program, loss of development rights, community cohesion, access to essential services etc.) and benefits of the program (water quality benefits, reduction of flood risk, etc.) equally distributed across the affected actor groups?
- *Needs-based:* Does the buyout program prioritize supporting the community and residents who are most at risk for flooding and who have the least resources or capacity to mitigate and cope with flood damage?
- *Rights-based:* Do all actors have access to clean and affordable drinking water? Do local communities and their governments have the final and meaningful decision-making power on buyout properties?
- *Corrective:* Does the program prioritize the communities and families that experienced eminent domain to build the reservoirs?
- *Capabilities:* Does the program ensure that all local communities have the power to make decisions about land-use and develop a resilient local economy?

Recommendations for an equitable buyout program in the Catskills

Based on our answers to the framework prompts above we developed a series of recommendations that could be taken to address the equity challenges associated with the flood buyout program. Table 7 outlines these recommendations.



Equity Issue	Recommendation
<p>Short term planning limits community inputs and capacity to address the complex impacts of buyouts</p> <p><i>Relevant framework components: actors, pathways</i></p>	<ul style="list-style-type: none"> • Invest in community capacity to do comprehensive planning • Increase investment in program facilitators who are local and trusted
<p>Relocation efforts are insufficient, threatening community cohesion and vitality</p> <p><i>Relevant framework components: pathways, scale</i></p>	<ul style="list-style-type: none"> • Conduct a systematic investigation into relocation barriers
<p>History of tensions with New York City and DEP limit trust from local community</p> <p><i>Relevant framework components: pathways, principles</i></p>	<ul style="list-style-type: none"> • Directly acknowledge complex histories and existing tensions
<p>Success metrics used by DEP do not consider complex impacts and multiple facets of flood resilience</p> <p><i>Relevant framework components: principles</i></p>	<ul style="list-style-type: none"> • Utilize holistic indicators to improve program evaluation: <ul style="list-style-type: none"> ◦ Change in tax base ◦ Changes to the number of available housing units ◦ Number of individuals who remain out of the floodplain ◦ Would buyout participants make the same decision again?

Conclusions

When equity implications are incorporated into climate adaptation project planning and implementation, we can avoid maladaptation and improve the efficacy and effectiveness of our climate adaptation work. The goal of this guide is to provide adaptation practitioners with some steps to help wade through the messy interactions between climate adaptation and equity work. Our framework is based on an extensive review of the literature and breaks down equity into four conceptual components. We use these components to build a step-by-step process that helps organize the complexity of these issues with conceptual clarity. Ultimately, we hope this process helps facilitate a dialogue and identifies strategic next steps for making your adaptation project more equitable. This process is just an initial step in equitable adaptation, which requires working with trusted local partners and taking the time for community engagement in order to implement the framework and better understand equity concerns. We believe that this process can help you both prepare for that engagement and facilitate collaborative conversations with project partners.

If you found this guide useful or would like to learn more, feel free to reach out to our team!

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LIMITATIONS, NEXT STEPS, AND CONCLUSIONS

Limitations

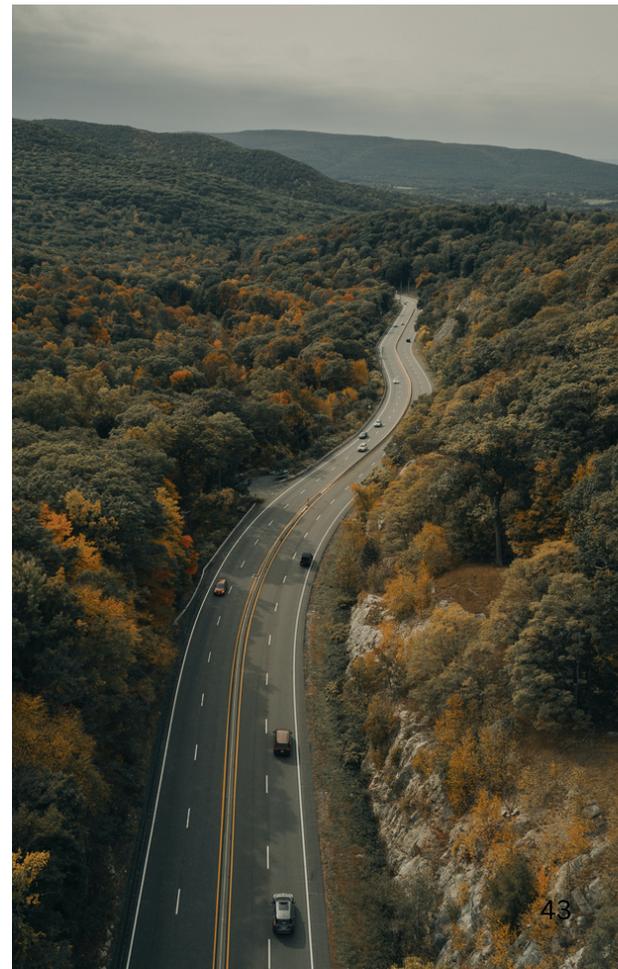
While we believe strongly in both the applied and theoretical value of this work, we also would like to acknowledge some important limitations that caution any overgeneralization of our findings.

First, both of the case studies involved in this work were focused on NbS to flood adaptation. While the lessons learned are valuable beyond nature-based flooding adaptation work, any application of the specific findings should be done carefully and with nuance. Second, our case study work was completed in upstate New York, and some of the findings may be specific to these communities and not as relevant to urban communities or communities outside of the Catskills region of New York. For example, while there is significant economic and social class inequity in our case study communities, these communities are largely racially homogenous with minimal potential to focus on the implications of racial equity. However, a significant proportion of the literature included in our scoping review was focused on racial equity contexts and is therefore included in our equity analysis framework. Finally, much of the data included in this study relied on the willingness of community members and adaptation practitioners to participate in an interview with our research team. While members of our team spent significant time on the ground in these communities, there is significant potential for sampling bias in our participant sample. Limitations specific to the methods of each research study can be found in the sections of the report dedicated to each study.

Next steps

This report is a conclusion of a project funded by the NatureNet fellowship. However, this is hopefully the beginning of a longer collaboration between our team, the communities of New York and The Nature Conservancy. Based on the results of this work and conversations with project partners, we hope to conduct future work focusing on:

1. Generalizing and comparing the results of our buyout case study research to other communities where different social identities are salient
2. Applying our equity analysis framework to adaptation strategies addressing climate hazards other than flooding
3. Investigating barriers and opportunities to translate the training practitioners receive on equitable adaptation into action
4. Disseminating and adapting the training guide as needed



Conclusions

This report summarizes a multi-objective research study that occurred over the course of two and half years, and the support of ten researchers. The goal of this research was to investigate the nuances of how climate adaptation strategies and social equity interact and provide conceptual clarity for adaptation practitioners navigating these interactions with applied examples. Our work combines a scoping review and two community case studies and culminates in an equity analysis framework and associated training guide for practitioners. The authors of this report strongly believe that both equity and effectiveness are interrelated objectives of any adaptation efforts. This work is just one small step in a larger effort by practitioners, community leaders and scientists around the world to ensure nature-based adaptation strategies leverage their potential to make communities both more climate resilient and equitable.

If you would like to learn more or discuss this work further, please contact one of the lead authors.

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