

1 **Unintended consequences of nature-based solutions: Social equity and flood**
2 **buyouts**

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12 **ABSTRACT:**

13 Nature-based solutions (NbS) can serve as effective strategies to promote the resilience
14 of both people and ecosystems in the face of climate change. However, these solutions
15 can exacerbate existing social inequities if they fail to adequately consider the complex
16 social contexts in which they are implemented. To better understand the equity
17 implications of NbS, and how to design and deliver such strategies more equitably, this
18 study applies a conceptual framework of 4 equity pathways (distributional, procedural,
19 recognitional, and structural equity) to a flood buyout program case study. We utilized
20 document analysis and semi-structured interviews to conduct an equity analysis of a
21 flood buyout program in a rural community in the Catskills region of New York. While
22 many aspects of the flood buyout program aimed to empower local municipalities and
23 landowners, local residents perceived a lack of decision-making power, negative long-
24 term impacts to community well-being, and tension regarding the current and historical
25 power differentials between these rural communities and New York City. Our results
26 indicate individual equity pathways interact with one another in complex ways. They
27 highlight the importance of comprehensive planning and evaluation of community
28 impacts to better address the systems-level relationships that shape the equity
29 implications of buyout programs.

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32 INTRODUCTION:

33 As climate change becomes an increasingly pressing challenge for communities across
34 the United States, actors at multiple scales are looking towards nature-based strategies
35 to help adapt to and mitigate climate impacts. According to the National Oceanic and
36 Atmospheric Administration, the U.S. experienced 360 ‘sustained weather and climate
37 disasters’ since 1980, costing more than 2.57 trillion dollars. Further, the average
38 number of disasters per year was 8.1 from 1980-2022, whereas from 2018-2022, the
39 average increased to 18.0 (1). In response to these trends, the Biden-Harris
40 administration has promised an investment of over \$5 billion through *The Inflation*
41 *Reduction Act* for ecosystem restoration, which includes actions such as protecting
42 forests from deforestation for their carbon sequestration potential and restoring coastal
43 wetlands to buffer coastal communities from storm surge and flooding (2,3). These
44 nature-based solutions are frequently characterized as a win-win strategy for both
45 people and nature. The term nature-based solution (NbS) refers to “*actions to protect,*
46 *sustainably manage and restore natural and modified ecosystems in ways that address*
47 *societal challenges effectively and adaptively, to provide both human well-being and*
48 *biodiversity benefits*” (4, p2). While research highlights the promising potential of NbS
49 for climate adaptation, these strategies do not exist in an ecological vacuum. They
50 interact with dynamic social systems, resulting in outcomes that are more nuanced and
51 complex than the popular ‘win-win’ terminology indicates (5). One example of such
52 complexity is the interaction between nature-based climate adaptation strategies and
53 issues of social equity.

54

55 Adaptation strategies can provide opportunities to address inequities and achieve
56 social justice. In one study, a Health Equity Impact Assessment concluded that publicly
57 accessible green infrastructure led to positive physical and mental health outcomes for
58 vulnerable communities in Ontario, Canada, demonstrating how green infrastructure
59 can address both stormwater challenges and improve public health outcomes (6).
60 Additionally, adaptation planning can engage and prioritize the voices of communities
61 that have historically been excluded from urban and municipal planning processes.
62 Another study showed how city officials in Barcelona, Spain are centering women and
63 low income and minority residents in plans to increase access to urban green amenities
64 (7). Despite these successful examples, adaptation strategies can also exacerbate or
65 create new inequities. In Philadelphia, for example, a climate adaptation program aimed
66 at increasing green infrastructure in at-risk neighborhoods led to gentrification and the
67 emigration of minority communities (8). Furthermore, without actively working to
68 dismantle the pre-existing equity issues that create barriers for certain social groups
69 from engaging in community planning processes, adaptation planning can further
70 exacerbate exclusion in local decision-making as a result of conscious and unconscious
71 cognitive racial bias and normative and institutional barriers (9). When used
72 thoughtfully, NbS can be used to achieve equitable adaptation, but when this interaction
73 is ignored, the unintended consequences of such strategies can exacerbate the
74 vulnerability of marginalized groups.

75 Scholars are paying increasing attention to this adaptation and equity nexus.
76 However, the literature is relatively nascent and often conceptually rather than
77 empirically focused (10,11). To better understand the equity implications of climate

78 adaptation and design more equitable adaptation strategies, data-driven studies in a
79 diversity of geographic and hazard contexts are needed. To help fill this gap, this study
80 investigates the equity implications of a flood buyout program in a rural community in
81 the Catskills of New York. We conduct an equity analysis of the program, creating a
82 case study which highlights the complex and place-based ways in which equity can
83 manifest and interact with a nature-based climate adaptation strategy. Further, we make
84 recommendations for how buyout programs can more effectively address equitable
85 adaptation.

86 As scholars exploring the intersection of equity and NbS, we believe it is
87 necessary to articulate how we conceptualize and define the concepts of equity and
88 justice. These terms get used frequently in the human-environment interactions
89 literature, yet their use often lacks the conceptual clarity necessary to synthesize and
90 apply work being done in this field. We want to recognize the plurality of accurate and
91 helpful definitions for the terms equity and justice. These vary by discipline, and often
92 between academia and practice. In the context of this paper, we will refer to *equity* as
93 the ‘fairness’ of a current state with respect to various social groups and *justice* as an
94 action taken to address issues of equity. We use a prioritarian or needs-based criteria
95 for equity and consider equity to be met (in the context of climate adaptation) when the
96 needs of the most vulnerable are prioritized (12). We further outline our conceptual
97 approach to understanding the complexity and characteristics of equity and situate it
98 within the broader environmental justice literature in the following paragraphs.

99

100

101 **LITERATURE REVIEW:**

102 **Conceptual approaches to studying equity and justice in climate change contexts**

103 Scholarly efforts to study the equity and justice implications of climate change are multi-
104 disciplinary and rely on a wide body of literature (10,11). Climate justice scholarship
105 investigates the fair and meaningful treatment of all social groups with respect to the
106 benefits, risks and costs associated with climate change. Well known work by Thomas
107 and Twyman often grounds conceptual understandings of equity and justice in climate
108 change scholarship – “equity and justice, or ‘fairness’, in climate change can be
109 considered in terms of processes, which largely relate to emissions issues, and
110 outcomes, which relate to impacts, vulnerability and adaptation” (13, p116). While this
111 broad definition facilitates a conceptual thread throughout much of the literature, the
112 applied and grassroots foundation of the environmental justice movement cannot be
113 overlooked. Specifically, the ‘Principles of Environmental Justice’ created at the First
114 National People of Color Environmental Leadership Summit, has guided both
115 grassroots social justice work and environmental justice research since their creation in
116 1991 (14). The ‘Principles of Environmental Justice’ provide guidance on how equity
117 and justice apply in a variety of different environmental contexts (e.g. pollution, worker’s
118 rights, nuclear waste, etc.) (14). A framework posed by the political theorist David
119 Schlosberg offers additional clarity in how and why issues of equity and justice
120 materialize in environmental contexts (15).

121 Schlosberg’s multidimensional framework of environmental justice (15) separates
122 justice into three dimensions: the distribution of costs, risks and benefits (distributional
123 justice); the meaningful inclusion of affected groups in decision-making (procedural

124 justice); and the prioritization of the well-being, knowledge and perspectives of affected
125 groups (recognition justice). Other scholars have adapted this work and added a
126 fourth dimension – structural justice, which includes the institution and systems that
127 shape people’s ability to participate in decision-making processes (16,17). For linguistic
128 consistency and conceptual clarity, this paper applies these four dimensions, referring
129 to them as *‘equity pathways’*, to guide our study design and analysis (see Figure 1).

130 INSERT FIGURE 1

131 Figure 1. Conceptual framework of equity pathways that guide this study

132

133 **Trends and gaps in the adaptation and equity literature**

134 Recent efforts have sought to systematically review and synthesize scholarship
135 investigating the equity implications of adaptation efforts and have found a clear need
136 for empirical investigation of how issues of equity manifest in climate adaptation efforts,
137 particularly beyond the distributional and procedural equity pathways. A systematic map
138 by Coggins et al. found that only 4.9% of the articles included in their search empirically
139 investigated the equity implication of climate adaptation (10). In a forthcoming scoping
140 review, authors found that 40% of adaptation and equity papers were conceptual in
141 nature, as opposed to empirical and data-driven (11). These reviews, in combination
142 with reviews of specific types of adaptation strategies (18,19), point to the importance of
143 scholarship that clearly investigates the ‘on the ground’ equity implications of climate
144 adaptation. Such scholarship is needed in combination with broader conceptual work to
145 reach a nuanced and evidence-based scientific understanding of adaptation and equity
146 interactions.

147

148 **Flood buyouts as nature-based solutions for adaptation**

149 Buyouts (also called strategic or managed retreat) involve purchasing risk-prone
150 properties to move infrastructure and people out of harm's way. Flood buyouts are often
151 facilitated by government agencies and have been historically used in communities
152 across the U.S. to address the issues of both riverine and coastal flooding (20,21). They
153 can function as NbS due to their potential to restore and protect the ecological integrity
154 of floodplains (22,23).

155 Research reviewing the complexities of buyout programs identify several
156 potential equity implications. An analysis of eight U.S. buyout programs highlighted a
157 lack of transparent decision-making and reliance on financial cost-benefit analysis that
158 may “promote disproportionate retreat in low-income or minority communities” (24, p1).
159 Additionally, multiple studies point to limited access to buyout funding mechanisms for
160 communities with low financial resources or municipal capacity (21,25). In a 2022
161 review, authors note that buyouts simultaneously have the potential to build community
162 climate resilience and negatively impact individual households (26). To further
163 understand such potential equity implications, these scholars underscore the need for
164 multi-scalar, multi-dimensional and place-based analyses of buyout programs.

165 The aim of this study is to use a clear conceptual framework to analyze the
166 equity implications of a buyout program. This work provides a case study analysis of
167 how equity and adaptation interactions manifest in a single municipality while explicitly
168 recognizing the multi-scalar nature of this regional buyout program involving multiple
169 communities. The research question that guides this work is: How does a regional

170 buyout program, designed as a NbS to reduce flood risk and improve water quality,
171 interact with multiple equity pathways (distributional, procedural, recognitional,
172 structural) to produce a community's local experience with the program?

173

174 **METHODS:**

175 **Case study community:**

176 *Community selection*

177 This case study research was conducted using a transdisciplinary approach (see Steger
178 et al., 2021 for further discussion of transdisciplinary environmental research). As such,
179 the community at the center of this research was selected based on several criteria.

180 First, as The Nature Conservancy in New York is both the funder and practitioner
181 partner in this research, the selected community has a pre-existing relationship with The
182 Nature Conservancy in New York's climate adaptation team. Such relationships are
183 critical to conducting effective community-based research that adds to both theory and
184 practice (27). Second, the selected community is actively engaged in a flooding
185 adaptation strategy. Third, the community is home to diverse social groups with
186 increased potential for pre-existing inequities. For this criterion, we relied on indicators
187 from census data such as the diversity index, percent of households below the poverty
188 line, Gini index, median household income, median age, median rent costs, percent of
189 population with documented disability, and percent of people with English as a first
190 language. Based on these criteria, we narrowed down potential communities to a
191 handful of locations, and selected the final community based on local leadership interest

192 and capacity. Throughout this article, we refrain from naming the specific community or
193 providing identifying information to protect the anonymity of participants.

194

195 *Community and watershed background*

196 The case study community is located in the Catskills region of New York State and is
197 home to under 5,000 residents with a density of less than 1,000 people per square mile
198 (28). This New York City ‘bedroom community’ was hit hard by the housing market
199 impacts of the COVID-19 pandemic. Housing costs have increased by 27 percent
200 between 2020 and 2022 and had a vacancy rate of 1.81% in 2020 (29). In addition,
201 issues of transportation access, food security and healthcare access significantly impact
202 the lives of the most vulnerable residents, a pattern of challenges familiar to many rural
203 communities across the U.S. (30,31).

204 The case study community is located within the New York City Watershed, which
205 is:

206 “... *the largest unfiltered water supply in the United States, serving 9 million New*
207 *Yorkers with about 1.3 billion gallons of clean drinking water each day. The New York*
208 *City Watershed spans nearly 2000 square miles, extends 125 miles north and west of*
209 *New York City, and includes 19 reservoirs. It is also home to nearly 1 million*
210 *inhabitants” (32).*

211 To protect water quality and maintain their ability to use unfiltered water (see
212 Pires, 2004 for discussion about New York’s Filtration Avoidance Determinations (FAD)
213 from the Environmental Protection Agency), New York City spends significant resources
214 to avoid point source pollution, such as flood water runoff, within the watershed. One

215 strategy is their Land Acquisition Program, which is mandated to protect both water
216 quality and the vitality of local communities in the watershed. NYC officials estimate that
217 without the FAD, building the necessary water treatment facilities would cost upwards of
218 1 billion dollars USD, with annual costs of over 100 million dollars to provide the drinking
219 water for 8.5 million consumers (33).

220 NYC's Department of Environmental Protection (DEP) has a controversial history
221 in the region due to its rapid land acquisition and subsequent control over land use in
222 the region. Since 1997, the percentage of total city and state protected land within the
223 west-of-Hudson watersheds has "increased by at least 18%, with over 154,000 acres
224 acquired through fees or easements, at a cost of almost \$500 million" (34, p201).

225 Additionally, the initial creation of multiple reservoirs in the watershed occurred through
226 eminent domain in the early 1900's (35). Multiple families in this case study community
227 have ancestors that were forcibly removed from their farms and communities to build
228 the reservoirs.

229

230 *Flooding and buyouts in the NYC watershed*

231 Many rural communities in the Catskills are experiencing the effects of climate change,
232 particularly from increased flooding. As major storms and subsequent floods in the last
233 two decades (such as Hurricane Irene (2011) and Hurricane Sandy (2012)) have
234 caused significant damage to infrastructure and property, national, state and local
235 efforts have focused on improving the flood resilience of local communities. One of the
236 programs that emerged from these efforts is the New York City Funded Flood Buyout
237 Program (NYCFFBO), a subprogram of the DEP's Land Acquisition Program. The

238 purpose of this regional program is to support buyouts of residential and commercial
239 properties in the 100-year floodplain located in the New York City Watershed. The
240 program seeks to get people and property out of harm's way and simultaneously reduce
241 the risk of point source pollution created from flood damaged properties (36).

242 To qualify for the program, the property must be at high risk for flood damage
243 according to local flood analyses and receive municipal government approval to
244 participate. After the property is sold, it is transferred to local government ownership and
245 a reuse plan is established, preventing future development but allowing for conservation
246 and recreation activities. The program attempts to address issues of relocation by
247 making some funds available to relocate housing and businesses within the region.

248 The history of eminent domain, the multi-scalar nature of the program, the dual
249 intended outcomes of the program, and the pre-existing equity concerns that challenge
250 rural communities make this buyout program a salient case study for an equity analysis
251 of NbS climate adaptation effort.

252 **Data collection:**

253 To investigate the equity implications of this regional buyout program in the case study
254 community, we used a combination of document analysis and semi-structured
255 interviews..

256

257 *Document Analysis*

258 We first conducted a document analysis of all online publicly available media covering
259 the NYCCFFBO program and the case study communities' engagement with the
260 program. Our process was guided by Grant's guidelines for social research with

261 documents (37) and Hancock and Alogzzine’s guidelines for case study research (38).
262 Table 1 lists inclusion and exclusion criteria for our document analysis. The document
263 search was conducted in May of 2022 and utilized broad search engines as well as
264 specific searches on municipal websites, DEP’s website and websites of related
265 organizations and institutions. In total 68 documents and 20 media articles were
266 included in our document analysis, with over 4,000 pages of text.

267 **Table 1.**
268

Inclusion Criteria	Exclusion Criteria
<ul style="list-style-type: none">• Available to the public• Have a listed author - Author can be an individual or the name of the publication or organization• Be specific to DEP land acquisition program facilitation of flood buyouts in the case community or the land acquisition program, more broadly• Can include but is not limited to policy documents, program evaluations, MOUs between program stakeholders, reports about specific buyouts, funding agreements, public communications, online press articles, etc.• Documents published in 2011 or later (after hurricane Irene which spurred the establishment of NYCFBBO)	<ul style="list-style-type: none">• Drafts of a document• Email exchanges• Documents published prior to 2011

269
270
271 *Semi-structured interviews*

272 In addition, we conducted semi-structured interviews with three groups of community
273 members. The first group included community members who owned properties that
274 were eligible for a buyout and had either participated in the program or been

275 approached about the program. The second participant group included community
276 members with a decision-making or facilitation role in the buyout program. These
277 included elected municipal leaders, town board members and individuals working for the
278 institutions that had a management role in the buyout program. The third participant
279 group included community members living near bought out properties but did not own
280 flood-prone properties that qualified for a buyout.

281 In total, 17 members of the community were interviewed, relatively evenly across the
282 three participant groups. We relied on a combination of snowball and strategic sampling
283 for participant recruitment. These interviews lasted between 1 to 3 hours in length and
284 occurred via video call, phone call, or in-person meeting, based on participant
285 preference and needs. Interviews were audio recorded and then transcribed using Otter
286 AI software (2022), and then manually checked for accuracy. Interview data was
287 collected between November 2023 to February 2024.

288 *Ethics statement*

289 This research was approved by the institutional review boards at the University of
290 Colorado Boulder (21-0497) and The Nature Conservancy. Written consent was
291 obtained from all interview participants

292

293 **Data analysis**

294 Interview transcripts and documents were coded using a thematic analysis process
295 (39). The environmental justice framework outlined above (15–17) was used to
296 deductively guide coding. The data was coded for the following themes:

297 (1) Distributional Equity: How are the cost and benefits of the program distributed
298 across different actor groups?

299 (2) Procedural Equity: Whose perspectives and input are included in program
300 processes and decision-making?

301 (3) Recognitional Equity: What outcomes does the program really prioritize? Whose
302 experience does it prioritize?

303 (4) Structural Equity: What pre-existing equity issues influence the processes and
304 outcomes of the program?

305 **RESULTS:**

306 **Distributional Equity: How are the cost and benefits of the program distributed**
307 **across different actor groups?**

308 *Conditions supporting distributional equity*

309 When discussing impacts of the buyout program, interviewees and data from the
310 document analysis described both beneficial and harmful impacts (see Figure 2). With
311 respect to beneficial impacts, interviewees characterized the program as an effective
312 strategy for reducing risk to flooding and in some cases, alleviating the financial distress
313 experienced by property owners (either from flood damage or flood insurance costs).
314 One participant reflected on the impacts of the flooding prior to the establishment of the
315 buyout program.

316 *“The flood buyout didn't come in time for those people and they lost their place*
317 *and I still can see them sitting there crying with their head in their hands... they*
318 *lost their family house and business”.*

319 Some participants used these examples to describe the buyout as the only
320 option to get people who were financially struggling with the flood damage, out of
321 the floodplain.

322 “... I just think that was it (the only option). That was the savior. It was a lifeline
323 that was thrown to those people, because there was nothing else. What else
324 could there be? I mean, what else had the money, finances behind it and the
325 legal ability to do it? No, that was the... that was the only option for them. Either
326 that or drown. Yeah, that was it...sink or swim”

327 *Conditions reducing distributional equity*

328 While participants positively reflected on the program's ability to reduce flood risk in
329 watershed communities, they also discussed more indirect impacts that they felt
330 disproportionately negatively impacted their watershed community. These negative
331 impacts fell into three primary categories: i) impacts to essential services, ii) impacts to
332 housing affordability, and iii) impacts to community cohesion. While related, these three
333 categories represent distinct ways that the buyout program has manifested at the
334 community scale. Participants also expressed that the buyout has had uneven impacts
335 across individual residents of the community, based on one's tenure in the community
336 and other factors such as age and income.

337 Impacts to essential services were primarily discussed as threats to healthcare
338 services, emergency response services and food security. One of the properties that
339 had received a buyout was a local healthcare clinic that had been significantly damaged
340 by Hurricane Irene. Although there were significant efforts to relocate the clinic in the
341 community but outside of the floodplain, regional scale development pressures and

342 healthcare industry trends that threaten rural healthcare access prevented the
343 relocation of the facility. This left residents both within and outside of the municipality
344 with extremely limited access to medical services. One interview participant noted:
345 *“they’re [larger medical companies] pushing out the most essential service to hundreds*
346 *of square miles here. I mean, it’s really, it’s a huge area with no doctor. It’s really big.*
347 *Because we had people from X County, from X County, from X, we had people from far*
348 *away coming here”.*

349 An emergency response station was also approved for the buyout but has
350 experienced extreme difficulty in securing the funds to rebuild updated infrastructure on
351 a nearby property outside of the floodplain. Until relocated, this leaves critical
352 emergency response services at extremely high risk of flooding, hindering capacity to
353 respond to emergencies in a storm or flood event.

354 The local grocery store also meets the qualifying criteria for the buyout, and while
355 there are seemingly no current plans for the buyout of this property, it highlights the
356 complexity of buyouts in communities with concentrated essential services in the
357 floodplain. Interviewees acknowledged that the loss of the grocery store would turn the
358 community into a food desert, expressing that this loss would be the *“nail in the coffin”*
359 for the community.

360 When asked about the impacts of the buyout program, participants also indirectly
361 discussed issues of housing affordability. As a ‘bedroom community’ of NYC struggling
362 with a surge in second home purchases, short term rentals and a post-Covid housing
363 market crisis, community leaders described the difficulty of supporting buyouts while
364 simultaneously addressing issues of housing affordability. Data from the document

365 analysis indicates that completed and slotted properties for buyouts have or will remove
366 a handful of housing units (with the exact number dependent on ongoing negotiations)
367 in the community. While participants noted the difficulty in quantifying the impact of
368 these losses on the housing market, they highlighted the need for the buyout program to
369 have a more explicit focus on potential impacts to housing. Due to the steep topography
370 of the area and the significant amount of land dedicated to conservation for the purpose
371 of water quality, participants described any buyout of a residential property as a
372 multiplier of local challenges with housing affordability and availability. When
373 referencing the plans and analyses required for a community to be eligible for buyouts,
374 one interviewee referenced a lack of focus on housing:

375 *“They were talking about properties and moving buildings, and reuse of land. I*
376 *had to make them go back, and just change the language to address tenants and*
377 *people. So there's a natural inclination for people that do some of this analysis,*
378 *especially engineering firms, to just look at it from a very technical moving pieces*
379 *around kind of a thing. But again... what gets lost? The community. The people,*
380 *you know? I couldn't believe it. I'm like, you know, you didn't include any*
381 *housing!”*

382 Furthermore, the buyout program negatively impacted community cohesion and
383 culture in the study community. Several interview participants expressed concern about
384 what would be left of the community in the future as a result of the buyouts. One
385 individual wondered, *“what does it do to a community when there's nothing left?”* and
386 described their sadness at living through the *“decay”* of their community. These
387 concerned residents suggested that the buyout program does not do enough to

388 acknowledge these losses and “*make the community whole*” again after buying out
389 properties. They urged for a more holistic approach to community needs and an
390 acknowledgement that the program isn’t just about property values and money, but that
391 it’s also about the social fabric of the community. One of the residents whose family had
392 lived in the community for multiple generations and had relocated out of the area after a
393 buyout reflected that they have not been able to regain the sense of community in their
394 new location.

395 It is important to note the intersecting impacts of losing essential services and
396 losing community cohesion. This is particularly salient when considering a community
397 the size of this study community, where the loss of a single business can have an
398 outsized impact, compared to larger or more densely populated communities. Several
399 participants described the local grocery store not only as an essential service, but also
400 as a gathering place that contributes to the town’s sense of community. One individual
401 mentioned that seeing neighbors at local businesses “*kept everybody going*” during the
402 COVID-19 pandemic. Many of the commercial properties involved in the buyout
403 program were described through this lens by participants, which highlights both the
404 tangible economic benefit they bring to the community and the intangible benefits to
405 community culture and cohesion.

406 Interviewees also highlighted that the program impacts in the community do not
407 affect all residents equally. One interviewee noted that those residents located on the
408 western side of town are more vulnerable to the potential loss of services, as they are
409 significantly farther from other services. Residents without access to reliable
410 transportation, such as low-income households or elderly residents are also especially

411 vulnerable to the loss of businesses and services. Another individual described the loss
412 of community culture, and transition of the community from a cohesive village to a
413 *“highway with plazas,”* as particularly detrimental to children and the school community,
414 as a regional school sits at the center of many of the buyouts. Further, the buyouts were
415 described as a *“line in the sand”* between newer and longer-term residents. One
416 participant noted, *“I think it’s harder to let go of something that’s been in your family for*
417 *generations.”* In general, longer-term residents were described as having deeper place
418 attachment and a more difficult time adjusting to the changes in the community.

419

420 INSERT FIGURE 2

421 Figure 2. Subthemes of distributional equity

422

423 **Procedural Equity: Whose perspectives and input are included in program**
424 **processes and decision-making?**

425 *Conditions supporting procedural equity*

426 Data from the document analysis and participant interviews create a picture of a
427 program that is both seemingly designed around prioritizing local community decision-
428 making and also inadequately takes into consideration the complexities of community
429 engagement and power. In terms of effective program design, notable components
430 include municipalities having the final say on both their participation as a community
431 and individual property agreements. Additionally, outreach to eligible property owners
432 about the potential of a buyout is conducted by municipal representatives, and the
433 communities are encouraged to take ownership of the property once structures have

434 been removed. Further, the program had recently discontinued using a monetary cost-
435 benefits analysis as an eligibility criterion for properties, in an effort to acknowledge the
436 difficulty in capturing the non-monetized benefits and costs of buyouts. All of these
437 process components of the program were mentioned by participants as critical for
438 supporting community level decision-making and authentic engagement in the program.

439

440 *Conditions reducing procedural equity*

441 However, interviewees also indicated that the program still had some significant
442 challenges with respect to centering local community decision-making. One interviewee
443 stated that opportunities to provide input felt superficial and intentionally limited, as
444 though the decision-making process already had a “*predetermined outcome.*” They
445 specifically cited limited community meeting agendas, which hindered constructive
446 debate, and majority opinions ignoring dissenting voices at meetings. Some participants
447 describe this as creating an environment which provided limited opportunity for
448 individual voices to provide feedback and feel heard.

449 Additionally, participants reflected on how much decision-making power
450 individual property owners actually had, given the lack of other affordable adaptation
451 options available for a property owner who rejects a buyout offer. One individual noted
452 that, when a homeowner rejects a buyout offer, there “*doesn’t appear to be any good*
453 *options*” for that individual. There was a sense that residents who participate in the
454 buyouts are lucky to receive the “*opportunity*” to get paid market value for their
455 properties. Other interviewees noted that, after Hurricane Irene, an initial FEMA buyout
456 process (prior to the establishment of the NYCFBBO program) left participants

457 exhausted and had negative emotional impacts equal to those of the hurricane itself.
458 Overall, residents agreed that the buyout program was a better option for residents than
459 a FEMA buyout or than doing nothing, but that it wasn't 'good' option for residents.

460 Participants also highlighted a need for a more holistic approach to buyout
461 program planning and decision-making. The buyout program was implemented as a
462 response to immediate needs, which inevitably led to a short-term planning approach.
463 One individual noted that it would have been beneficial to *"look at the program as a*
464 *whole"* further in advance, and develop more robust decision-making structures, rules
465 and definitions. Another interviewee expressed that there is a need for the buyout
466 program to be more aligned with community development planning and compared early
467 property buyouts as equivalent to *"running with scissors"*. Specifically, participants cited
468 a need for science, including climate change projections, and local knowledge to be
469 more incorporated into buyout planning efforts.

470 While participants struggled with the fast speed of the buyout planning process,
471 they also lamented the lengthy buyout approval process. The continued risk of living in
472 areas highly susceptible to flooding, as well as the need for the money the buyout will
473 provide, prompted many participants to believe that the current process is too slow. One
474 individual noted, *"Money is at the top of [people's] minds...if it can't happen in the*
475 *timeframe they need, and they can't be given a fair price, they might try to sell it..."* One
476 reason cited for the length of the process is a gap in needed technical assistance. Since
477 the program requires many organizational steps, there are currently limited resources
478 and individuals with the capacity to support property owners through the many steps of
479 the process. However, participants strongly underscored the importance of the local

480 people currently in facilitation roles and expressed gratitude to multiple buyout program
481 managers with long-standing connections and relationships in the area.

482

483 **Recognitional Equity - What outcomes does the program really prioritize? Whose**
484 **experience does it prioritize?**

485 *Recognition of watershed community needs versus New York City needs*

486 The tension between buyout program priorities was apparent in the analyses of both
487 public document and interview data. The most obvious tension is between the dual
488 outcomes of the larger Land Acquisition Program to both improve water quality for the
489 city of New York and safeguard the vitality and well-being of the rural communities in
490 the watershed. While the program's objective of reducing flood risk manifests by getting
491 people and structures out of harm's way, multiple interviewees described water quality
492 as the ultimate priority of the program above any impact on rural community well-being.
493 In describing this fundamental challenge of the program, one participant stated:

494 *"We need to try really hard to represent the people in the conversations*
495 *happening at the higher level... I don't know that everybody's thinking about the*
496 *actual people in this whole scenario. They're seeing buildings and they are*
497 *seeing water quality and they're seeing things in their way".*

498 Such a perspective is supported by a lack of publicly available program evaluation
499 metrics used to assess community impact. However, program facilitators indicated that
500 the program is working towards including more community impact metrics as a recent
501 assessment by the National Academies of Sciences, Engineering and Medicine (2020)
502 highlighted the need for such indicators. Additionally, this shift is seemingly supported

503 by the recently dropped cost-benefit analysis eligibility criterion. Participants described
504 this change as an important recognition of the hard-to-monetize costs and benefits
505 associated with community resilience and well-being.

506

507 *Recognition of differing needs within the community and across time*

508 Tensions between quality of drinking water for NYC and watershed community's well-
509 being is not the only recognitional equity tension at play. Additionally, participants
510 highlighted a tension between the well-being of a single property owner and the well-
511 being of the community as a whole. When describing the difficulty in weighing multiple
512 needs and scales, one interviewee explained:

513 *“When you start to see and weigh the benefits of community assets versus*
514 *personal loss and personal tragedy, that becomes a very difficult decision and a*
515 *compelling decision... I mean, are you going to say to a property owner that has*
516 *had a business in your town for 5, 10, 20 years, that you're not going to let them*
517 *leave and they're going to have to stay there and suffer and they won't be able to*
518 *sell their property, you're going to have to continue to pay flooding insurance they*
519 *can't afford? There's been an eventual inevitable into that story. And it's... it's*
520 *devastating”*

521

522 **Structural Equity: What pre-existing equity issues influence the processes and**
523 **outcomes of the program?**

524 *History of eminent domain*

525 Multiple interviewees brought up the history of eminent domain in the watershed and the
526 injustices created by forced relocation of communities in the early 1900's to build the
527 reservoirs that make up the New York City drinking water system. Participants
528 discussed how this injustice shapes the interactions between the local community and
529 DEP: *"What my ancestors and the communities went through... And then to have it
530 happening in real time. It was just really weird... it felt like it was happening again".*

531 Another interviewee explained the current tension went beyond that of between rural
532 communities and DEP but between members within the same community:

533 *"I do think in some ways that the history of the reservoir has exacerbated the
534 tension between people who are from here and people who come here, because
535 they think that there are really good reasons for that tension. People were
536 displaced when that reservoir was built, and the reason that reservoir was built,
537 everyone knows, it's because New York City folks needed water..."*

538 However, participants also discussed the lack of recognition of this history. Our
539 document analysis supports this perspective none of the publicly available documents
540 explaining the buyout program explicitly recognizing the historical use of eminent
541 domain and the resulting tensions.

542

543 *Present day resource disparities between rural municipality and NYC*

544 Simultaneously, interviewees discussed the more recent history of litigation between
545 NYC and watershed communities, specifically referencing the significant power
546 differentials – both in terms of their financial resources available and the role NYC plays
547 as a significant landowner in this case study community. Interviews identified NYC's

548 seemingly endless ability to engage in litigation and local communities' limited ability to
549 hold the DEP accountable for the buyout program:

550 *“You know, the city is king here, whether we like it or not, and we, in my town*
551 *have reaped the benefits of that, which is that our taxes are lower and we have*
552 *the incredible reservoir in our area. The base side, is that they've take a lot of*
553 *land that didn't belong to them and now people's homes are flooded, but you*
554 *know, that happened 100 years ago... and [Community name] benefited from the*
555 *city, in many ways... someday we would have to pay the piper so the buyouts*
556 *seemed pretty much in tune with that.”*

557

558 *Pre-existing challenges facing rural communities*

559 In addition to historical and present-day issues surrounding land ownership, pre-existing
560 equity concerns specific to rural communities have the potential to significantly influence
561 the buyout program. As mentioned above, these challenges include equitable access to
562 essential services, and potential impacts on available housing. The pattern in how/if
563 these properties have taken a buyout, and whether they will be relocated, is mixed and
564 property-specific. However, the potential impact of such buyouts is deeply influenced by
565 insecurities around food and healthcare that plague rural communities across the
566 country. Participants explained that these pre-existing issues make each property
567 buyout that much more contentious.

568

569 **Discussion:**

570 These results paint a picture of a community's complex experience with a climate
571 adaptation strategy. While the benefits of the buyout program far outweigh the costs for
572 NYC, a comparison of costs versus benefits for the study community is less clear
573 (distributional equity). While the program removes people from harm's way and out from
574 underneath the financial strain of living in a floodplain, more indirect costs such as loss
575 of essential services, housing units and community cohesion complicate any cost-
576 benefit analysis. With respect to program decision-making (procedural equity), some
577 process components center local decision-making power, and other process
578 components limit the agency of community members. To complicate matters, the
579 program must contend with competing goals (recognitional equity) and is seemingly
580 designed to prioritize water quality over community well-being, short term over long term
581 outcomes, and individual property rights over community wide resilience. All of this is
582 occurring with an undercurrent of historical use of eminent domain, significant power
583 differentials between NYC and rural local governments, and pervasive economic and
584 social challenges already facing rural communities in the region (structural equity).

585 These findings highlight the multitude of ways equity and adaptation can interact
586 to produce how a community experiences a buyout program. The manifestations of this
587 interaction provide applied examples that can be leveraged to reach equitable
588 adaptation outcomes rather than exacerbate inequities. Notably, we think this data
589 underscores a combination of theoretical and applied implications, further discussed
590 below: i) the importance of diversity of ways that individual equity pathways can interact
591 with one another, ii) the power of procedural equity and its relationship with agency, and

592 iii) the need for future research that investigates the efficacy of using equity frameworks
593 to proactively design equitable adaptation.

594

595 **Interactions between equity pathways**

596 A significant amount of research applies adapted versions of Schlosberg's
597 environmental justice framework. However, much of this work focuses on distributional
598 and procedural equity pathways. The literature that does expand to structural and
599 recognitional equity pathways often discusses them in isolation from one another
600 (Walker et al., in press). Notably, our results explicitly highlight the interactions between
601 equity pathways and provide concrete examples that prove powerful in supporting a
602 clearer conceptual understanding of such interactions in a climate adaptation context.

603 For example, the data suggest a clear link between structural and distributional
604 equity. Systemic rural inequities such as access to housing, healthcare and food
605 security (structural) interact with the buyout program to make the loss of properties that
606 house these essential services incredibly salient, particularly with community members
607 already struggling with these issues (distributional). In this example, the structural
608 inequities make the buyout program a 'threat multiplier', exacerbating the distributional
609 impacts. While the loss of a handful of residential properties or a healthcare clinic might
610 not be a significant impact on its own, when it occurs in a community already struggling
611 with essential service access, these buyout impacts are amplified. This is especially the
612 case for low-income community members who already experience these challenges
613 more significantly.

614 The data further highlight a relationship between structural and procedural equity.
615 The use of eminent domain in the early 1900's to construct one of the reservoirs for the
616 New York City drinking watershed resulted in the removal of the ancestors of present-
617 day community members from their land and livelihoods. Participants discussed the
618 forceful removal and lack of compensation given to property owners as the building
619 blocks for the mistrust community residents have with NYC DEP. All three groups of
620 participants talked about this mistrust as a barrier dissuading community members from
621 engaging in planning and community engagement opportunities around the buyouts.
622 This structural and historical inequity means that even if opportunities for meaningful
623 engagement are provided (procedural), they will struggle to achieve authentic
624 engagement, because the often unacknowledged and contentious history between DEP
625 and the community dissuade community members from engaging.

626 Data from both the interviews and document analysis also point to the influence
627 that the recognitional equity pathway has on both distributional and procedural
628 pathways. As mentioned in the results section, recognitional inequities result from a
629 tension in program priorities: NYC water quality versus community well-being, private
630 property owners versus the broader community and short term versus long term
631 outcomes. Arguably, the program strongly prioritizes one side of each of these tensions:
632 water quality, private property and short-term outcomes. This is unsurprising, as the
633 program is nested within a larger societal system that also tends to prioritize these more
634 tangible and measurable priorities. However, these choices mean that program impacts
635 disproportionately benefit the residents of New York City and property owners within the
636 community (distributional). They also shape the effectiveness of efforts to authentically

637 prioritize local decision-making power (procedural). Attempts to engage community
638 members in planning and feedback have muted impact when residents feel like the
639 program is stacked against their interests. Figure 3 illustrates these connections in
640 addition to the procedural-distributional interaction discussed in previous literature.

641 INSERT FIGURE 3

642 Figure 3. High-level interactions between equity pathways

643

644 Acknowledging these interactions is a critical step towards moving conversations
645 about equity and adaptation from vague, conceptual and overly simplistic mental
646 models to more concrete and nuanced understandings. Equity pathway interactions can
647 help us understand why and how adaptation strategies can result in equitable versus
648 inequitable outcomes.

649

650 **Salience of procedural equity – a pathway to agency and adaptive capacity?**

651 Interviewees from all three participant groups discussed the importance of procedural
652 equity in multiple ways: 1) in the lengths the program design goes to prioritize local
653 decision-making power, 2) in the lack of comprehensive planning and 3) the lengthy
654 timing of the program. One of the most striking references to procedural equity was the
655 discussion of meaningful choices or agency. Scholarship in the climate adaptation
656 spaces frequently talks about agency, or the ability to make choices and ensure those
657 choices have meaningful impact on one's life (40) as an important component of
658 adaptive capacity (41). The buyout program is voluntary, and the local officials make the
659 final say on eligible properties – this sounds like decision-making power. But when a

660 resident or community's options include 'bad option 1' or 'bad option 2,' it begs the
661 question of whether this reflects real agency and if the decision feels like an actual
662 choice. And, if not, is an artificial choice equitable? While the long-term implications of
663 buyouts on property owners and community well-being is a critical gap in the literature,
664 the results of this study encourage us to think about the power that authentic procedural
665 equity might play in supporting these long-term outcomes. Further, the concept of
666 agency calls us to move beyond a superficial understanding of procedural equity. We
667 cannot just ask, 'who's included in decision-making processes?' but also, 'do these
668 processes include meaningful choices?' Such a holistic notion of agency provides a
669 useful indicator for equitable adaptation.

670

671 **Recommendations for equitable buyouts and climate adaptation**

672 These insights point to meaningful and actionable steps that adaptation practitioners
673 and municipal leaders can take to make their buyout programs more equitable. First,
674 investing more resources into comprehensive planning would better address the
675 complex, systems-level relationships that buyout programs have with the equity
676 pathways, as well the larger social-ecological system in which they are embedded.
677 These planning efforts should consider not only how the buyout program influences
678 flood resilience, but also how it influences broader resilience and equity challenges
679 related to accessing essential services. For example, comprehensive planning, led by
680 empowered and trusted community members, might enable a community to identify
681 which structural inequities (e.g., rural challenges with healthcare) would be exacerbated
682 by the impacts of a buyout program for certain residents (e.g., loss of a clinic on older

683 residents or residents with transportation challenges). Increased financial and human
684 resources dedicated to planning would allow for the time and information needed to
685 consider how the buyout program could proactively address these distributional
686 impacts. Such a planning process would allow for the time and information needed to
687 proactively think through complex equity implications, consider the interactions between
688 different equity pathways and avoid unintended consequences.

689
690 Second, the findings underscore the importance of local people who are trusted
691 and have the technical expertise on how the program works. This is an important
692 strength of the buyout under study, and these individuals serve as important information
693 brokers and critical linkages to acknowledging and addressing structural inequities
694 (such as the history of eminent domain) and providing local knowledge to program
695 facilitators. By investing in relationship building and program facilitators who are trusted
696 in the community, programs can achieve equity via multiple pathways.

697 Our third recommendation is to include the impacts to community resilience to
698 economic and social shocks more broadly within the 'cost' of the program. Secondary
699 impacts of the program on health outcomes, sense of community, food security or
700 housing affordability are natural results of the complex system buyouts occur within. But
701 it is only by tracking these impacts, and explicitly considering them a 'cost of the
702 program' rather than an externality, that we can begin to leverage the resources needed
703 to mitigate them and reduce potential inequities.

704 Relatedly, more holistic program evaluation would help better prioritize equitable
705 outcomes. Such efforts should seek to measure impacts to flood resilience, overall

706 resilience and process engagement. Distributional and procedural equity provide
707 framing for these indicators, while structural and recognitional pathways provide an
708 understanding of why and how these indicators occur. If equity is both a means and an
709 end for adaptation, these data-driven recommendations point to potential leverage
710 points for designing buyout programs.

711

712 **Limitations and future directions**

713 While we believe our research yields powerful lessons for both the theory and practice
714 of equitable adaptation, we do not want to overstate the generalizability of our case
715 study. The place-based nature of this research is both one of its biggest strengths and
716 limitations. It has allowed us to collect data that richly describe a rural community's
717 experience with a buyout program and analyze how equity shapes that experience. The
718 patterns in this data have the potential to function as 'signposts' for future equity
719 analyses and give concrete examples of how equity pathways manifest in applied
720 adaptation contexts. However, this also means that the applicability of our findings to
721 other buyouts programs, other communities and broader adaptation work should be
722 critically considered. Additionally, there is a potential for sampling bias in our
723 interviewing process. Significant resources were spent to ensure we reached out to
724 every single participant of the buyout program in our study community, as well as
725 neighbouring community members. Further, our research collaborators had existing
726 relationships within the community, and we relied on local leadership to ensure our work
727 was relevant and took into consideration local context. However, the primary researcher
728 was an 'outsider' to the community, and the time availability of participants and their

729 relationships with our collaborators may have influenced whether people were willing to
730 engage with the study.

731 Despite these limitations, the findings and associated implications of this work
732 point towards some important next steps for the research community. First, this work
733 begins to fill a gap in the literature that investigates the equity implications of climate
734 adaptation in rich detail and at a local scale, specifically in the context of a rural
735 community where economic inequity is a salient characteristic. While macro-level
736 studies looking at broader patterns in buyouts have focused on racial equity, more local-
737 level studies are needed to thoroughly understand the unique experiences of
738 communities of color and how equity pathways materialize. Secondly, this study uses
739 the equity pathways as a conceptual tool for understanding the impacts of a buyout
740 program after the buyouts have occurred. Our team thinks this conceptual tool may also
741 be useful in helping adaptation practitioners proactively think through the equity
742 implications of their adaptation work, and as a result, design more equitable adaptation
743 programs. However, minimal work has been conducted to confirm this hypothesis, and
744 research that robustly evaluates the use of equity analysis tools and associated training
745 would make an important contribution to equitable adaptation.

746

747 **CONCLUSION**

748 Nature-based solutions can serve as effective strategies to promote the resilience of
749 both people and ecosystems in the face of climate change. However, it is important to
750 incorporate social equity considerations into the design, implementation, and evaluation
751 of these strategies to avoid maladaptation or exacerbating the marginalization of

752 vulnerable groups. While much of the scholarship investigating social equity and climate
753 change adaptation is conceptual and abstract in nature, this research provides an
754 opportunity to consider the ‘on the ground’ implications of a flood buyout program on
755 social equity within a case study community. Further, this work applies an equity
756 analysis using a four pathways framework grounded in the justice and equity literature.
757 Our findings point to the nuanced and varied ways in which different equity pathways
758 interact to produce a community’s experience with adaptation and underscores the
759 importance the concept agency plays in our understanding of procedural equity. Our
760 analysis points to specific recommendations to improve the equity of the buyout
761 program we examined, but also leverage points that can be applied to increase the
762 equity of NbS strategies more broadly.

763

764

765

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767

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772

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776

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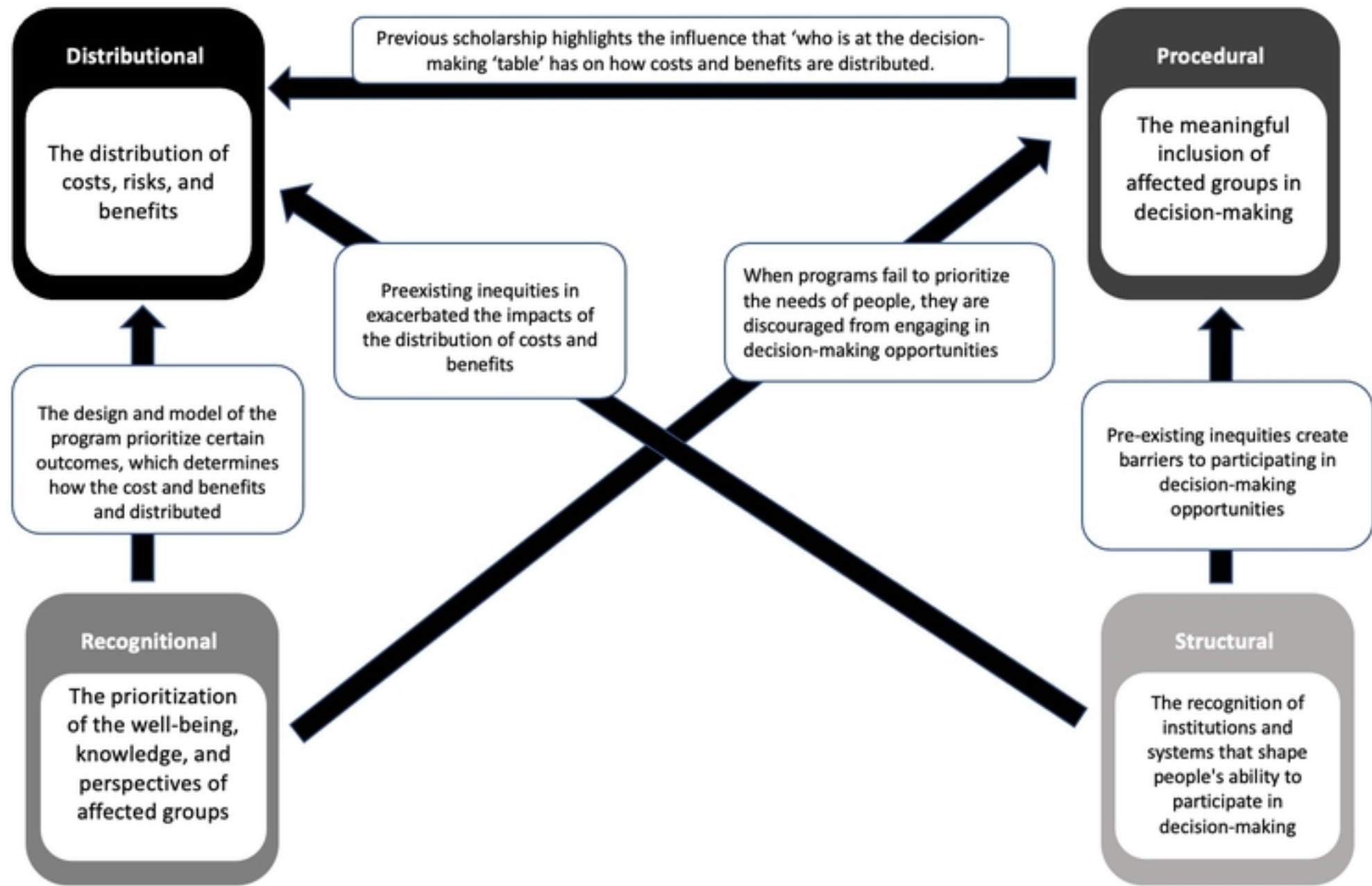


Figure 3

Distributional 'Costs' of Buyout program

Impacts on essential services

- Properties that have either been bought out or qualify for buyout reduce access to healthcare services, food security and emergency response services

Impacts on housing affordability

- Community struggling with lack of affordable housing and residential properties have been a part of the buyout program.

Impacts on community cohesion

- Concern that loss of business and residents damage 'social fabric' of community.

Distributional 'Benefits' of Buyout program

Reducing flood risk

- Fewer business and residents are located in the most flood-risk area of the community

Alleviating financial distress

- Buyout provided a 'way out' for residents struggling with flood damage and flood insurance costs

Figure 2

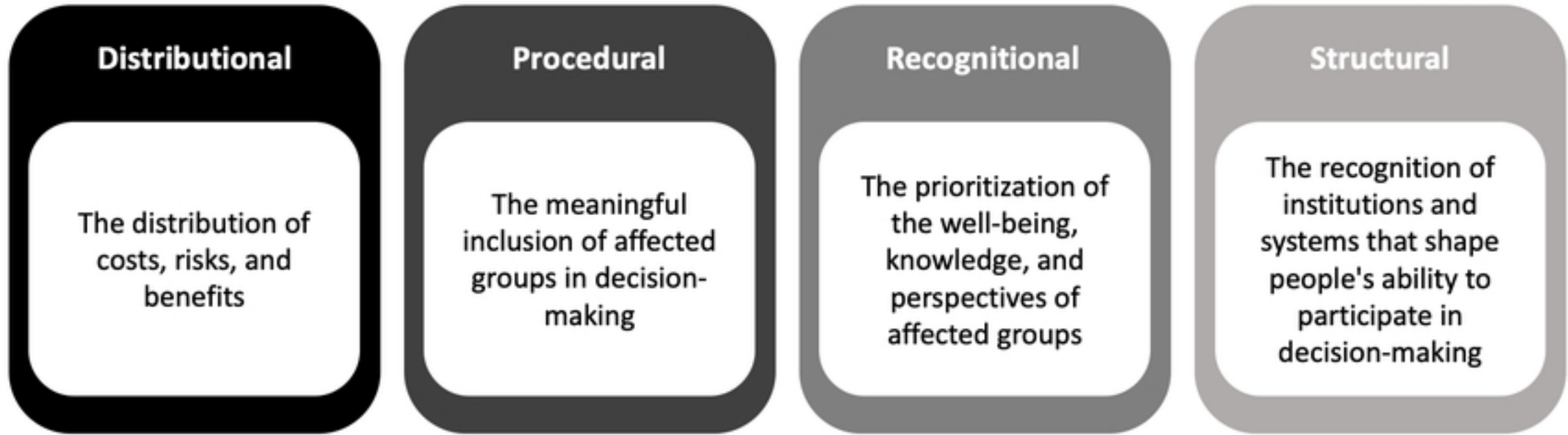


Figure 1