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Are managed retreat programs successful and just? A global mapping of success typologies, justice dimensions, and trade-offs

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ABSTRACT

As managed retreat programs expand across the globe, there is an urgent need to assess whether these programs are reducing exposure to climatic hazards, enhancing adaptive capacity, and improving the living conditions of communities in a just and equitable manner or are they exacerbating existing risks and vulnerabilities? Strictly speaking, are retreat programs successful? Using an expansive intersectional justice approach to examine 138 post-resettlement case studies published between 2000 and 2021 across the Global North and South, we identified five typologies of success – techno-managerial, eco-restorative, compensatory, reformative, and transformative – and their trade-offs and synergies. Our *meta*-analysis incorporated a variety of metrics: relocation types, funding, decision making, socio-economic class, land use change, livelihood options, and social impacts. We found 26% of cases failed, 43% were successful, and 30% are on-going and therefore success was undetermined. The techno-managerial cases, while successful in the limited terms of relocating residents, paid little attention to equity and justice. The eco-restorative and compensatory cases reduced hazard exposure but revealed the synergies and tensions associated with social, ecological, and intergenerational justice. The reformative and transformative cases improved community wellbeing, rootedness, and access to livelihoods while incorporating diverse justice concerns to different degrees. By intersecting these typologies with multiple dimensions of justice, this study advances a novel planning and analytical tool for assessing the potential success or failure of current and future retreat programs.

1. Introduction

Climate-induced disasters are among the leading causes of displacement across the world. In the past decade, millions of people have been displaced by a combination of floods, tropical cyclones, sea level rise, wildfires, hurricanes, and droughts. In 2020 alone, weather related events displaced 30 million people in the Global South and North¹ (IDMC, 2021). This pattern continued in 2021, when within a span of a month, flash floods displaced thousands of people in Germany, China, Belgium, India, London, Philippines, and Nigeria (Kang, 2021; Harvey, 2021; Davies, 2021a; Davies, 2021b). The most recent Intergovernmental Panel on Climate Change (IPCC) report has raised alarm

about such trends becoming the ‘new normal’ as weather variability and extreme events intensify across the globe (IPCC, 2022). Even when efforts on carbon emission reductions are sped up, the world will likely experience the delayed impacts of previous warming (IPCC, 2021). Up to 216 million could be internally displaced between 2030 and 2050 according to a World Bank report (World Bank, 2021). Other studies predict under high emissions scenarios, sea level rise alone could displace 630 million people globally by 2100 (Kulp and Strauss, 2019). To avert mass displacements and reduce vulnerability to climate change, states and communities across the globe have embarked on planned relocation or resettlement (the term commonly used in the Global South) (Edwards, 2013; Arnall, 2019; Miller and Dun, 2019) also called

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¹ In this study, we use the Global South to broadly describe countries located in Latin America, Asia, Africa, and Oceania (except Australia and New Zealand). The Global North encompasses countries in Europe and North America, including Australia and New Zealand. We acknowledge descriptors such as Global South and North do not effectively capture the diversities among countries nor do they neatly describe the wealth, politics, power relations, regional and cultural differences between and within these continents (Dados & Connell, 2012).

managed retreat, planned retreat, or strategic relocation (the phrase used in the Global North) (Koslov, 2016; Siders, 2019a; Thaler, 2021).

Managed retreat refers to the purposeful relocation of people, infrastructure, homes, and businesses from hazard-prone areas and resettling them in relatively safer locations (Hino et al., 2017). This may be in anticipation of projected climate impacts (Alexander et al., 2012; Albert et al., 2018), and/or in reaction to intensifying storms, floods, shoreline erosions, sea level rise, drought and wildfires (Ferris, 2015; Yi, 2015; Arnall, 2019; Siders, 2019a; Horton et al., 2021). Retreat typically occurs when and where *in-situ* adaptation is no longer socio-ecologically viable or financially feasible (Haasnoot et al., 2021; Ajibade and Siders, 2022). Retreat can be voluntary or mandatory (Siders, 2019b; Ajibade, 2019; Farbotko et al., 2020); driven by individual, community, or governmental actors (Albert et al., 2018) and may involve property acquisitions or buyouts (Mach et al., 2019; Siders, 2019a), land swaps (Okada et al., 2014; Arnall, 2019), and abandonment or rezoning of residential land (Lawrence et al., 2020; Nguyen, 2020). Also, it can occur at multiple scales: households, community, village, city, or country (Smith, 2013; McAdam, 2014; McAdam and Ferris, 2015; Arnall, 2019; Chappell, 2019; Seebauer and Winkler, 2020) and implementation may take one to twenty years on average (Siders and Ajibade, 2021).

Despite its potential benefits, managed retreat remains a controversial strategy (Kothari, 2014; Ferris, 2015; Baja, 2021). This is because retreat may redistribute risk, exacerbate historical inequalities, or perpetuate uneven vulnerability and livelihood losses among different groups (Alvarez and Cardenas, 2019; Ajibade, 2019; Siders and Ajibade, 2021). It can also disrupt community rootedness and resourcefulness thereby exacerbating class, gender, and racial disparities (Ajibade and Siders, 2021). For example, retreat programs have been found to marginalize the poor while facilitating class-based displacements (Ajibade, 2019; Ajibade, 2022) and racialized forms of climate gentrification. Climate gentrification is a process in which wealthier people fleeing climate-risky areas spur higher housing prices in safer areas, thereby increasing housing prices and driving poorer communities out of those locations (Keenan et al., 2018). Retreat can also lead to loss of culture, identity, and ancestral sites (Mortreux and Barnett, 2009; Arnall, 2019; Hermann and Kempf, 2017; Kita, 2017), including fractured family and kinship ties (Iuchi, 2014; Gebauer and Doevenspeck, 2015), and increased indebtedness and poverty through loss of land and assets (Hammond, 2008; Miller, 2020). Furthermore, the decision to retreat or not is rife with inequalities and distrust among power brokers and communities (Jessee, 2020; Huang, 2021). Notwithstanding these challenges, adaptation experts, scholars, and communities insist retreat is a viable mechanism for getting people out of harm's way (Koslov et al., 2021; Haasnoot et al., 2021; Mach and Siders, 2021). Indeed, abandoning or rebuilding communities in vulnerable locations (Stefancu, 2021) can be as profoundly unjust as moving them into areas that are likely to be inundated (Islam, 2021) or with limited means for survival (Huang, 2018). These multifaceted problems make retreat a politically contested disaster risk reduction and climate adaptation strategy.

While humans have relocated throughout history due to shifting climatic conditions, advocates of modern forms of retreat are not often sure these programs are successful, that is, achieving their intended purposes of reducing vulnerability, enhancing adaptiveness against current and future hazards, and improving the living conditions of people in a just and equitable manner (Smith, 2013; Siders, 2019b; Carey, 2020). Nonetheless, what 'success' means is highly contested and context-dependent. To determine the 'success' of any retreat program one must ask the following questions: Who defines success in retreat – individuals, whole communities, planners, government, non-governmental organizations (NGOs) or researchers? Success for whom – relocating communities, receiving communities, the ecosystem, politicians, or property developers? What are the tradeoffs of retreat – physical safety, cultural preservation, health and psychological well-being, or access to livelihoods? At what point in the relocation process is

the retreat deemed successful? What will happen in new resettlement areas in 30, 50 or 100 years, considering current and future climate impacts on different locations? These questions are not an exhaustive list, but they illustrate the complexities of retreat and the multiple dimensions and perspectives through which success may be evaluated.

In this study, we interrogate the actions, processes, outcomes, and trade-offs that shape success and/or failure of retreat programs as documented in peer-reviewed academic literature published between 2000 and 2021. We place affected frontline communities at the center of our analysis by focusing on their lived experiences in a post-resettlement context. We do not prescribe a specific "model of success"; rather, our goal is to draw attention to different typologies of success identified from analyzing 138 post-resettlement case studies from across the world. By drawing attention to these cases, we hope to partially answer these questions: how can retreat be a part of the solution to climate displacement and not a problem? How can equitable and justice-oriented retreat be achieved? And what analytical frameworks can help adaptation planners and communities in their decision making, planning processes, and post-resettlement evaluation?

Following this introduction, we deconstruct the idea of success – conceptualizing it as a relative notion that extends from a narrow understanding to a more expansive meaning. We then draw on lessons from development-induced resettlement literature to examine the idea of failure and success in relocation programs, while using an intersectional justice analysis as a critical lens for categorizing and evaluating the spectrum of successes and justice dimensions in managed retreat programs. This is followed by our methods section, describing how we developed the typologies of success and protocols for obtaining and analyzing the 138 case studies. Afterwards, we present the findings and discussions while offering empirical cases to illustrate each typology. We conclude with a reflection of the utility of our typologies in future relocation research, practice, and policies.

2. Theorizing success in resettlement programs

2.1. Success as a contested concept

In a simplistic sense, success is the achievement of a set goal. If community A set a goal of relocating 200 of its 500 villagers from a frequently flooded island to the mainland, and it relocates 200 or more within a set timeline, that will be considered a success. If community B is able to relocate all of its 500 residents while ensuring their participation and access to decent housing and jobs in the resettlement site, then community B can be seen as more successful than A. If community C accomplished a similar goal and also ensured land restoration socio-cultural ties, livelihood improvements and reduction of unintended harm while balancing the justice concerns of residents, then C may be seen as more successful than A and B. These hypothetical cases show the concept of 'success' is not static or solely contextual, but relative, dynamic, and contingent on many factors.

In this study, we view success on a spectrum – from a narrow conceptualization based on the actions taken to implement retreat to a more expansive understanding that encompasses goals, actions, processes, norms (implicit and/or explicit), and outcomes experienced by individuals and communities across different timelines and spatial scales. Our expansive approach requires a recognition of past, present, and potential future injustices that could result from retreat. In terms of past injustices, we must remember that many of the communities facing retreat decisions today have undergone serial forced displacements in the past 150 years – starting with colonial resettlement projects which forced people to settle in vulnerable geographies (Herrmann, 2017; Jessee, 2020; Baja, 2021), to the post-colonial modernization schemes and the neoliberal policies of the 1970s and 1980s which pushed the working class and the poor further into the fringes, thus expanding socio-economic disparities throughout the 1990s and 2000s (Cernea, 1996; Ajibade, 2022). Not only do these historical injustices shape

current conditions and stressors, they must be foregrounded in any robust understanding of a successful retreat.

Scholars have argued development-induced displacement and resettlement (DIDR) and managed retreat share some similarities (e.g., they both pose a threat to community rootedness and are embroiled in an interplay of politics and power) (de Sherbinin et al., 2011) and a few differences with respect to drivers, funding, timing, and resettlement guidelines (Wilmsen and Webber, 2015). Therefore, lessons from the DIDR scholarship can be transferred into retreat praxis. In terms of its pitfalls, studies show DIDR projects involving highways, dams, hydro-electricity, transportation systems, energy infrastructure, and urban renewal programs have not only impoverished those forcibly resettled (de Wet, 2006; Bisht, 2014; Scudder, 2012) but have resulted in landlessness, joblessness, homelessness, increased morbidity and mortality, food insecurity, economic marginalization, and negative social, cultural and psychological impacts (de Sherbinin et al., 2011; Picciotto et al., 2018). A study by Piggott-McKellar et al (2020) which examined the success of 203 DIDR case studies using a sustainable livelihoods approach found physical outcomes as the only aspect in which improvement was seen while social, financial, human, natural and cultural outcomes fared worse. Other studies suggest certain guiding principles can increase the chances of a successful resettlement. These include: consultation and meaningful participation of affected persons in decision making in every phase of the relocation (Chatterjee, 2009); developing resettlement action plans to drive the relocation process; the community taking responsibility for the construction of the resettlement sites (Wilmsen and Webber, 2015); relocating people within short distances of originating sites (Wilmsen and Wang, 2014); ensuring poverty reduction and livelihood restoration for affected communities (Chatterjee, 2009; Ferris, 2011), providing adequate funding and training of officials responsible for resettlement (de Sherbinin et al., 2011); and allowing resettlers to retain ties with originating communities while forging bonds in the new location to enable new forms of rootedness (Wilmsen and Wang, 2015).

In the retreat literature, there has been little theorization of success but no clear understanding or agreement on the factors that constitute a successful climate-related resettlement. In the early 2000s, successful retreat meant focusing on success of logistical undertakings such as finding appropriate land in a safe location, securing adequate funding, achieving consultative decision-making, and ensuring bureaucratic efficiency in the implementation process (Dickinson and Webber, 2007; Ahmed and McEvoy, 2014). Not only was this prioritization of efficiency a problem but the trade-offs of freedom, livelihood, socio-cultural ties, housing tenure, land rights, and psychological well-being, for physical safety was a challenge for many communities (Dickinson and Webber, 2007; Kothari, 2014). These problems, therefore, led certain communities and scholars to reject the word “managed retreat” noting that it perpetuates colonial, racist, and class-based resettlement patterns (Maldonado et al., 2020; Baja, 2021). Instead of the risk-and-efficiency based approach, activists, scholars, and communities have demanded for justice-based approaches that open up opportunities for transitioning towards transformative trajectories that center people and climate justice at multiple scales – households, city, state, national and global (Miller, 2020; Siders et al., 2021; Ajibade and Siders, 2022).

2.2. Success, trade-offs, and intersectional justice

Critical scholars have pushed for a radical turn in retreat noting the decisions about who relocates, when, how, and why have justice implications (Ajibade, 2019; Siders, 2019b; Miller, 2020; Thaler, 2021). Also, language, power, and politics play a role in the way retreat is planned, implemented and managed, thereby shaping the outcomes for different groups (Kothari, 2014; Baja, 2021; Gebauer and Doevenspeck, 2015; Marter-Kenyon, 2020). Furthermore, retreat policies and plans may be used to promote pre-existing development goals and land transfers by aligning with the agendas of the elites and property

developers while incentivizing the resettlement of low-income communities (Kothari, 2014; Ajibade 2019). Past approaches to addressing the inequalities in retreat programs have focused on two aspects of justice to highlight the ways in which the terms of relocation may be challenged and renegotiated: these are *procedural* (i.e., fairness, transparency, and participation of affected communities in decision making processes and the accountability of institutions in charge) and *distributive* (i.e., the uneven benefits and losses experienced by different groups due to retreat). While useful this minimalist approach does not account for the mutually reinforcing ways power, politics, policies, rights, and opportunities intersect to enhance structural privileges (usually for wealthy and white communities who are protected through in-situ adaptation) (Ajibade, 2019; Siders and Keenan, 2020) and disadvantages (usually for the poor who have little control over where they live) (Keenan et al., 2018; Ajibade, 2022). The scholarship on anti-racist studies (Crenshaw, 1989), critical feminist theory (Crenshaw, 1991; Terry, 2009; Sultana, 2021), and critical climate justice (Kajiser and Kronsell, 2014; Sultana, 2021) have brought into renewed focus the often-overlooked interconnected harms, inequities, and vulnerabilities that marginalized groups experience as a result of climatic risks and climate mitigation and adaptation plans (de Sherbinin et al., 2011, Sultana, 2021; Ajibade, 2022). We argue that an intersectional analysis of success in retreat programs goes beyond conventional approaches to illuminate three critical issues: 1) how multiple identities and social axes such as class, race, gender, abilities, age, nationality, geography, and natural resource dependency shape the ways different individuals and communities experience climate risk (Erwin et al., 2021) and access resources for in-situ adaptation or retreat (Siders and Ajibade, 2021); 2) how the axes of disadvantages and opportunities overlap with economic, political, social, and cultural aspects of life to amplify the benefits or risk associated with retreat (Ajibade and Siders, 2022); 3) how different justice frameworks can enable solidarity and agency across and beyond social categories and what this means not solely for the success of retreat programs but for advancing the broader goals of climate justice.

In this study, we employ an intersectional analysis that goes beyond individual and group-based differences to broaden the scope and assessment of a successful retreat to include six dimensions of justice: *social justice* (prioritizing marginalized groups in the redistribution and access to social goods such as affordable housing, jobs, livelihoods, and infrastructure) (Siders, 2019a); *environmental justice* (centering participatory decision making and fairness in the distribution of benefits and burdens of retreat) (Ajibade, 2019); *ecological justice* (prioritizing land, ecosystems, and non-human species in retreat) (Schlosberg, 2013); *recognition justice* (acknowledging colonial legacies and contemporary inequities such as territorialization, redlining, uneven development, and gentrification in shaping the lived experiences of Indigenous communities, island nations, communities of color, informal settlers, migrants, and other marginalized groups) (Whyte, 2011; Maldonado et al., 2013); *restorative justice* (addressing historical wrongs through the protection of customary land rights, housing tenure, affirmative actions, and reparations) (Tabucanon, 2014; Gharbaoui and Blocher, 2016); *intergenerational justice* (attention to the effects of retreat on future generations) (Maldonado et al., 2013; Jessee, 2020). Not all successful retreats will address these six dimensions of justice but certainly programs that do may be seen as being at the apex of a success pyramid.

We acknowledge that different frameworks of justice may contradict rather than intersect in ways that enhance benefits for affected communities. For example, actions associated with ecological justice aimed at revitalizing terrestrial or aquatic environments may encroach on social justice by requiring the removal of people from fragile locations (Wu, 2015). On the other hand, such efforts may preserve fragile ecosystems for the benefits of future generations, thus supporting intergenerational justice. Similarly, retreat programs that prioritize intergenerational justice over environmental justice or social justice may be deemed unjust. Drawing on this understanding and a systematic review of the retreat literature we identify five typologies of success

(techno-managerial, eco-restorative, compensatory, reformative, and transformative) and highlight some of their benefits, trade-offs, and intersecting justice dimensions.

3. Research methods and categorization of success typologies

3.1. Systematic review and meta-analysis

Following a PRISMA method (Moher et al., 2009), we conducted a systematic review and meta-analysis of academic literature to identify patterns and commonalities that determine different models of success in managed retreat and to interrogate how they intersect with different dimensions of justice. Our systematic bibliographic search included published peer-reviewed articles and reports from online databases published between 2000 and 2021 on Web of Science and Google Scholar. The initial search terms were “climate migration”, “managed + planned retreat”, “managed + planned resettlement”, and “managed realignment”. The search yielded (n = 17,368 articles) on Google Scholar and (n = 633 articles) on Web of Science. These articles were screened through manual review to exclude papers focused on environmental or climate migration because they are different from managed retreat (Ajibade et al., 2020). We also excluded theoretical and conceptual papers on managed retreat as well as hypothetical case studies. Ultimately, 172 articles of empirical case studies were included in our dataset and coded by two coders who separated them into two categories: ‘post-resettlement’ and ‘on-going or proposed.’ A separate coder on the research team re-examined the articles to remove duplicate case studies (n = 36) where the same resettlement case was addressed by different authors. After this step, our total dataset was 138 case studies: post-resettlement cases (n = 96) and on-going (n = 42). For the post-resettlement case studies, we coded them either as *failed/unsuccessful* (n = 36) or *successful* (n = 60). The final case studies chosen for inclusion were coded for 45 variables that addressed important fundamental questions: Where is retreat happening? What was the resettlement type – individual, wholesale-community, or infrastructure? What is the socio-economic class of those resettled? What is the total number of households per resettlement? Who funded the resettlement? What was the climatic catalyst for the resettlement? Was the resettlement - reactive or anticipatory? What was the decision-making process? What was the impact on land and the people resettled? Did people return to the originating site? Our coding involved a reiterative process of over two years; as more information became available, codes were adjusted to reflect the most updated information for each case study. Two team members conducted a quality-control assessment to re-code and address any unreliable or conflicting codes. Our final database included answers to closed as well as open-ended narrative questions. The former facilitated a quantitative analysis of our categorical data (e.g., descriptive statistics in tables) and a mapping of retreat globally; the latter facilitated a contextual identification, categorization, and qualitative analysis of decision-making processes and success typologies.

Post-resettlement case studies coded as failed or unsuccessful were coercive, violent or involved threats of violence, lacked institutional support, lacked livelihood/and or physical safety in resettlement sites, increased exposure to climatic and environmental risk, and included a high rate of return to the originating site. For the successful cases, we reclassified them into five emergent typologies: techno-managerial, eco-restorative, compensatory, reformative, and transformative. Many of the case studies analyzed for this research were based on interviews with residents and some included communities’ views of the success of their resettlement programs as well as factors that shaped the success of such programs. Where available, such information was taken into consideration in the development of our typologies. Our typologies were created based on an inductive approach, which starts with observation of patterns, regularities, and differences among the case studies in order to reach a generalizable theory or conclusion (Thomas, 2006). In this round of categorization, we identified four distinct decision-making

approaches – top down, collaborative, community-led and polycentric. Top down decision-making is initiated and led by one or more governing bodies who maintain power and control over the process. Collaborative decision-making has a strong institutional process with options for community engagement. Community-led decision-making centers the community as rights-holders and decision-makers but may be supported by other groups or partners such as NGOs or governments. Polycentric decision-making involves multiple governing bodies overseeing varying scales of the relocation process from federal, state, local to community. We also identified different forms of improvements in physical safety and livelihoods; equity challenges; land use changes; impacts of relocation on the social and cultural lives of the resettlers; as well as justice dimensions that were centered through the relocation process (e.g., social, environmental, ecological, restorative and intergenerational justice). Finally, an expert elicitation protocol (Hemming et al., 2018) of the typologies was carried out to assess and confirm the validity of the results (see code book and supplementary materials). In the section below, we provide a short description of each typology discussing their strengths, drawbacks, and their dominant justice dimensions. After this we present our results along with five illustrative case studies to contextualize our theoretical framework and findings.

3.2. Descriptions of managed retreat success typologies

Techno-managerial typology – Goals and actions involve the removal of people and infrastructure from at risk locations. Success is defined by the resettlement itself (i.e. moving people from point A to B) and not the process or outcomes experienced by different actors (Tefera, 2009; Ahmed and McEvoy, 2014; Huang, 2018). These types of programs emphasize immediate risk reduction and promises of improvement in wellbeing, although not always delivered (Funder et al., 2018; Fernando, 2018). *Process*: State agents typically initiate these programs through top-down decision making, but resettlement could also be community-driven (Xiao et al., 2018; Albert et al., 2018). *Norms*: pays little to no attention to equity and justice (Lei et al., 2017; Huang, 2018). *Outcomes*: the resettlement of large numbers of people over a relatively short time span (Lei et al., 2017; Fernando, 2018; Xiao et al., 2018). *Drawbacks*: no guarantee of equitable access to land, housing, or livelihoods; further risk mitigation may be required in new resettlement sites and new vulnerabilities may be experienced in those sites (Ahmed and McEvoy, 2014; Fernando, 2018; Santiago et al., 2018).

Eco-restorative typology – Goals and actions involve restoring and revitalizing ecosystems from harms caused by direct human impacts, urbanization, and climate change. Programs may involve the resettlement of people and/or infrastructure or the decommissioning and abandonment of coastal defense infrastructure such as dams or levees in favor of natural floodplain systems (Du, 2012; Weisner et al., 2013; Schernewski et al., 2018; Spidalieri et al., 2020). *Process*: decision-making may be top-down, collaborative, or polycentric (Wu, 2015; Natural Resources Canada, 2020). Vacated land may be turned into green spaces, gardens, recreational areas for community (Spidalieri et al., 2020) or sacrificial zones for enhanced coastal and flood management (Maly and Ishikawa, 2013; Hazelden and Boorman, 2001; Schernewski et al., 2018). *Norms*: implicit attention is paid to at least one or two justice frameworks (e.g ecological justice and intergenerational justice). *Outcomes*: resettlement may lower infrastructure maintenance and costs, improve transit access, restore degraded ecosystems, and preserve endangered species, thereby yielding ecological benefits for present and future generations (Townend and Pethick, 2002; Du, 2012). *Drawbacks*: benefits of restorative spaces are not always evenly spread across populations (Loughran et al., 2019); projects may spur green/eco-gentrification (Gould and Lewis, 2018; Anguelovski et al., 2019); private, customary, or public land may become enclosed, and projects may take years to implement due to public resistance (de la Vega-Leinert et al., 2018; Schernewski et al., 2018). Also, resettlement may expand industrial activity and urbanization in other areas or lead to changes in

labor relations whereby land-owning resource-dependent communities become wage laborers (Wu, 2015).

Compensatory typology – Goals and actions include offering compensation schemes such as buyouts, grants, land, or housing to incentivize relocation from hazard-prone areas (Okada et al., 2014; Siders, 2019; Thaler, 2021). Process: compensations or buyouts may be initiated by the state, individuals, or communities and funding may be sourced from government agencies supplemented with other sources (Koslov, 2016; Mach et al., 2019). Decision making may vary from top-down to polycentric. Norms: implicit and/or explicit attention is paid to at least two justice frameworks (e.g social justice and ecological justice). Outcomes: individual autonomy in deciding resettlement sites may increase options for safer resettlement destinations with access to livelihoods and jobs, thereby increasing economic security (Siders, 2019b; Koslov et al., 2021; Nakelevu & Phillips, 2021). Vacated land may be restored to open spaces in perpetuity (Baker et al., 2018), thereby yielding ecological benefits for current and future generations. Drawbacks: buyouts may occur largely in low-income areas with low-education levels (Mach et al., 2019), and lengthy bureaucratic processes may delay assistance (Binder and Greer, 2016; Baker et al., 2018). Also, wealthier neighborhood or counties may have more resources and institutional capacity to apply for and dictate the terms of buyouts (Mach et al., 2019; Miao and Davlasheridze, 2022), renters may be left out (Dundon and Camp, 2021), and groups with weak bargaining and/or political power may be marginalized or receive unfair compensation (Siders, 2019b; Elliot et al., 2020).

Reformative typology – Goals and actions involve improving and empowering communities through restoration of livelihood sources, increased access to social services and infrastructure, and retaining of social and cultural ties (Koslov, 2016; Nakelevu and Phillips, 2021). Programs usually involve wholesale community relocation (Pinter, 2021) and acquisition of land along with construction of housing in agreed upon relatively safer locations (Spidaliere et al., 2020; Greer and Brokopp-Binder, 2017; Dale, 2022). Process: meaningful participation of residents from decision making to implementation (Koslov, 2016). Action Plans may be developed to drive the relocation process (See and Wilmsen, 2020). Norms: explicit attention is paid to at least three or more intersecting justices. Outcomes: the majority of resettlers benefit from the program, although variations may exist in the levels and types of benefits (See and Wilmsen, 2020; Dale, 2022). Drawbacks: new or different kinds of risk may be experienced in resettlement sites and well-connected members of the community may receive more benefit than others and thus leading to intra-community conflict (See and Wilmsen, 2020).

Transformative typology – Goals and actions propel structural change at the community level and resettlement programs emphasize an integrated approach to risk reduction, livelihood improvement, infrastructure access, social and place-based ties, cultural preservation, education opportunities for children and youths, community resilience, and climate mitigation. Process: community self-determination and robust participation are evident in decision making, planning, and implementation (Tronquet, 2015; Yarina et al., 2019). Residents take active responsibility in the selection of resettlement sites, housing design, and construction (Tronquet, 2015; Yarina et al., 2019). Norms: valuation of the losses and benefits of resettlement are expressed in more than monetary terms and explicit attention is paid to at least four or more intersecting justices. Outcome: enhanced community capabilities through preserving and improving social, cultural, ecological, economic, health and psychological well-being (Tronquet, 2015; Yarina et al., 2019). Drawbacks: prolonged decision making; trade-offs of livelihood types (e.g., from fishing to agriculture-based activities); risk mitigation may be needed in resettlement sites (McMichael and Powell, 2021); and gender inequalities may not be addressed if community decision making is based on local hierarchical structure and power relations (Bertana, 2020).

4. Results

4.1. Overview of successful retreat programs

In our analysis of the 96 post-resettlement cases, managed retreat was documented more in the Global South (61 %) compared to the Global North (39 %). Overall, there were 36 failed cases (38 %) and 60 successful cases (62 %). Case studies coded as failed or unsuccessful were largely in the Global South (94 %). In terms of the geographical distribution and prevalence of success typologies, techno-managerial cases make up a majority of the retreat in Asia (18.3 %) while Europe has a higher proportion of eco-restorative cases (11.7 %) and North America has a higher concentration of compensatory (20 %) and reformative typologies (6.7 %) (Table 1). The two documented transformative cases were in the Caribbean (Puerto Rico) and Pacific Islands (Fiji) (Fig. 1). Despite these geographic differences, techno-managerial cases encompass a substantial proportion of retreat cases globally while transformative constitute the smallest proportion of cases (Table 1). In our analysis, we documented that over 870,823 households (approximately 4,354,115 individuals) have been ‘successfully’ relocated through retreat programs over the last 20 years. This number is based on our 60 successful case studies. The majority of those resettled were in the Global South (99.2 %) (n = 863,971 households/4,319,855 individuals) compared to the Global North 0.8 % (n = 6852 households/34,260 individuals). A high proportion of those relocated globally were low-income households (79.5 %) and were relocated through techno-managerial programs (Table 1). Families relocated through transformative programs were also low-income groups. The middle and high-income groups were mostly relocated through compensatory programs. When it comes to relocation-type, wholesale community-type resettlement was prevalent in the Global South (68.6 %), and less common in the Global North (31.4 %) and were mostly techno-managerial (42.9 %) or reformative (28.6 %). A high proportion of individual-type relocations were compensatory (92.3 %) and the majority of infrastructure relocations were eco-restorative (83 %). The majority of successful retreats were funded by multiple sources (41.7 %), followed by federal (26.7 %), state (18.3 %) and philanthropic sources (5 %) (Table 2).

Decision-making processes varied across typologies. The majority of cases involved top-down (60 %), collaborative (16.7 %), community-led (15 %), and polycentric decision-making (8.3 %). The majority of the top-down cases were associated with techno-managerial, compensatory and eco-restorative typologies. Community-led decision making was mostly associated with the reformative typology while the transformative typology reflected both community-led and poly-centric decision making (Fig. 2). The climate hazards documented in the majority of the successful relocations were coastal risk (43.3 %), riverine flooding (41.7 %), and landslides (6.7 %). The anticipatory responses, that is, resettlement based on a combination of past and projected climate risk, were the most prevalent (55 %) and were often associated with eco-restorative (21 %) and techno-managerial typologies (15 %). The reactive responses, that is, resettlement triggered by a specific proximate hazard, were associated with mostly compensatory (21.7 %) and techno-managerial (13.3 %) typologies (Table 2). The transformative typology was solely anticipatory.

In our qualitative analysis, when we intersected the success typologies with different justice dimensions, we found that techno-managerial programs were limited in their attention to justice and equity. The eco-restorative programs, due to considerations for more-than-human actors, tend to center ecological and intergenerational justice. The majority of the successful compensatory programs emphasized ecological and social justice by paying attention to land use after resettlement and offering residents financial resources to rebuild their lives, housing, and livelihood elsewhere. The majority of reformative programs reflected recognition, social, environmental, and intergenerational justice. The transformative programs engaged all of the justice dimensions – recognition, social, environmental, ecological, restorative,

Table 1
Typologies of successful retreat programs by location, class, and number of households.

Typologies by location	REGION (n = 60)		CONTINENT (n = 60)						
	Global North	Global South	Africa	Asia	Caribbean	Europe	North America	Pacific Islands	South America
Transformative	1.7 %	1.7 %	0.0 %	0.0 %	1.7 %	0.0 %	0.0 %	1.7 %	0.0 %
Reformative	6.7 %	10.0 %	1.7 %	3.3 %	0.0 %	0.0 %	6.7 %	1.7 %	3.3 %
Compensatory	30.0 %	0.0 %	0.0 %	0.0 %	0.0 %	6.7 %	20.0 %	3.3 %	0.0 %
Eco-Restorative	18.3 %	3.3 %	0.0 %	3.3 %	0.0 %	11.7 %	6.7 %	0.0 %	0.0 %
Techno-Managerial	3.3 %	25.0 %	3.3 %	18.3 %	0.0 %	0.0 %	3.3 %	1.7 %	1.7 %
TOTAL	60.0 %	40.0 %	5.0 %	25.0 %	1.7 %	18.3 %	36.7 %	8.3 %	5.0 %
Typologies by people	CLASS (n = 39)		NUMBER OF RESETTLED HOUSEHOLDS (n = 46)						
	Lower	Middle	Upper	Various	1–50	51–200	201–1,000	1,001–10,000	>10,000
Transformative	5.1 %	0.0 %	0.0 %	0.0 %	2.2 %	0.0 %	2.2 %	0.0 %	0.0 %
Reformative	17.9 %	5.1 %	0.0 %	2.6 %	6.5 %	4.3 %	2.2 %	4.3 %	0.0 %
Compensatory	12.8 %	7.7 %	2.6 %	0.0 %	6.5 %	17.4 %	13.0 %	0.0 %	0.0 %
Eco-Restorative	5.1 %	2.6 %	0.0 %	0.0 %	2.2 %	2.2 %	2.2 %	0.0 %	2.2 %
Techno-Managerial	38.5 %	0.0 %	0.0 %	0.0 %	4.3 %	4.3 %	13.0 %	6.5 %	4.3 %
TOTAL	79.5 %	15.4 %	2.6 %	2.6 %	21.7 %	28.3 %	32.6 %	10.9 %	6.5 %

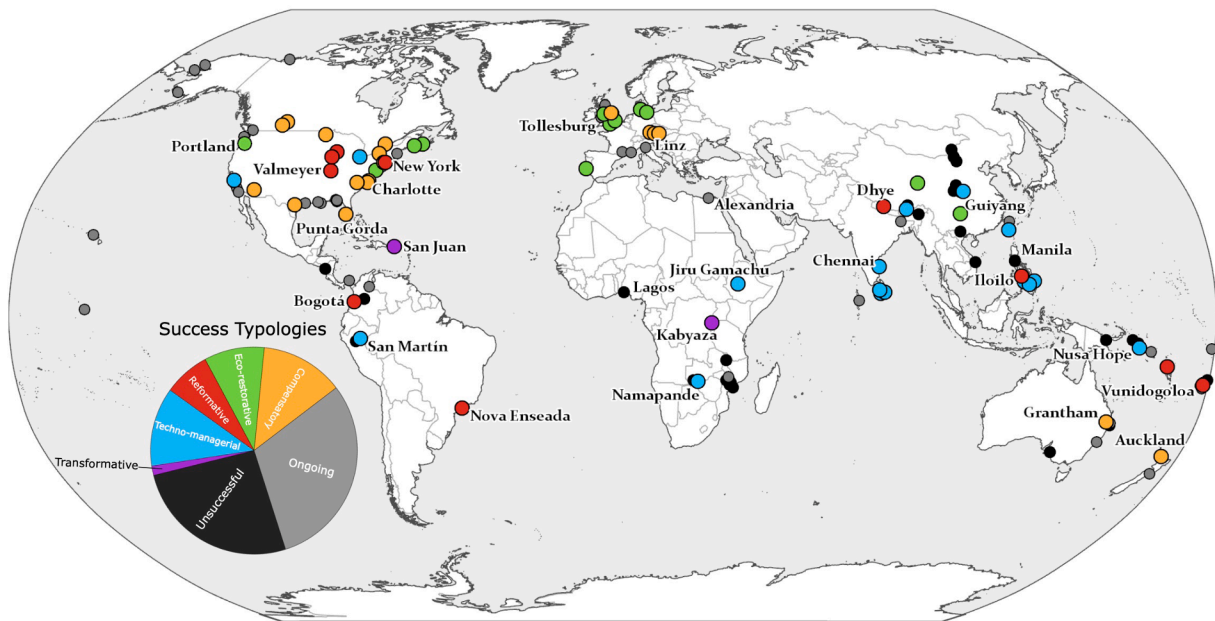


Fig. 1. Global distribution of success typologies in managed retreat programs.

Table 2
Typologies of successful retreat programs by climate hazards, responses, relocation-types, and funding.

Typologies by direct drivers	RESPONSE APPROACHES (n = 60)		CLIMATE HAZARDS (n = 60)						
	Anticipatory	Reactive	Coastal Risks	Drought	Grassland Degradation	Landslide	Riverine Risks	Multiple	
Transformative	3.3 %	0.0 %	1.7 %	0.0 %	0.0 %	0.0 %	1.7 %	0.0 %	
Reformative	6.7 %	10.0 %	6.7 %	0.0 %	0.0 %	1.7 %	6.7 %	1.7 %	
Compensatory	8.3 %	21.7 %	11.7 %	0.0 %	0.0 %	0.0 %	18.3 %	0.0 %	
Eco-Restorative	21.7 %	0.0 %	15.0 %	1.7 %	1.7 %	0.0 %	3.3 %	0.0 %	
Techno-Managerial	15.0 %	13.3 %	8.3 %	1.7 %	0.0 %	5.0 %	11.7 %	1.7 %	
TOTAL	55.0 %	45.0 %	43.3 %	3.3 %	1.7 %	6.7 %	41.7 %	3.3 %	
Typologies by implementation	RELOCATION TYPES (n=60)			FUNDING SOURCES (n=60)					
	Group	Individual	Infrastructure	Individual	Federal	State	Local	Philanthropic	Multiple
Transformative	3.3%	0.0%	0.0%	0.0%	0.0%	1.7%	0.0%	0.0%	1.7%
Reformative	16.7%	0.0%	0.0%	1.7%	3.3%	1.7%	0.0%	1.7%	8.3%
Compensatory	10.0%	20.0%	0.0%	1.7%	11.7%	5.0%	1.7%	0.0%	10.0%
Eco-Restorative	3.3%	1.7%	16.7%	0.0%	6.7%	5.0%	0.0%	0.0%	10.0%
Techno-Managerial	25.0%	0.0%	3.3%	3.3%	5.0%	5.0%	0.0%	3.3%	11.7%
TOTAL	58.3%	21.7%	20.0%	6.7%	26.7%	18.3%	1.7%	5.0%	41.7%

and intergenerational (Fig. 3), with one exception being the case of Fiji which did not include gender equality in decision making (Bertana, 2020). One might argue that the prevalence of specific typologies in

particular regions and countries reveal the sets of intersecting justices, norms, and values that planners, governments, and communities prioritize. Although, social contexts, regional histories, and political

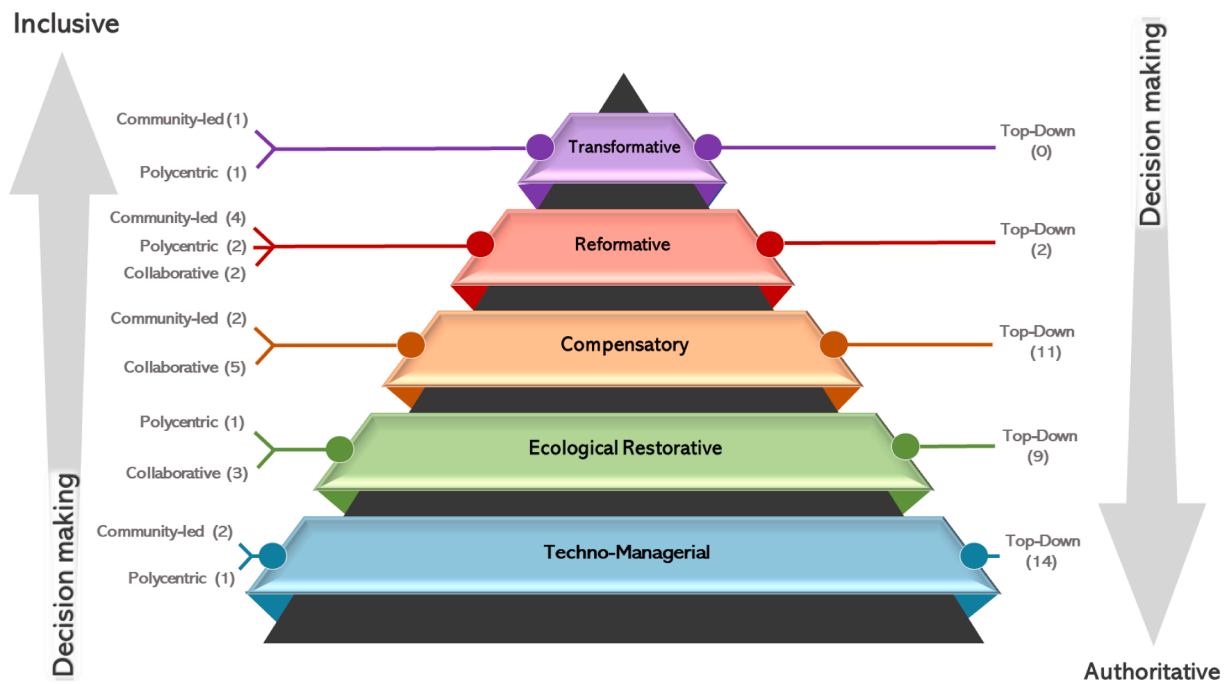


Fig. 2. Decision-making approaches and managed retreat success typologies (n = 60).

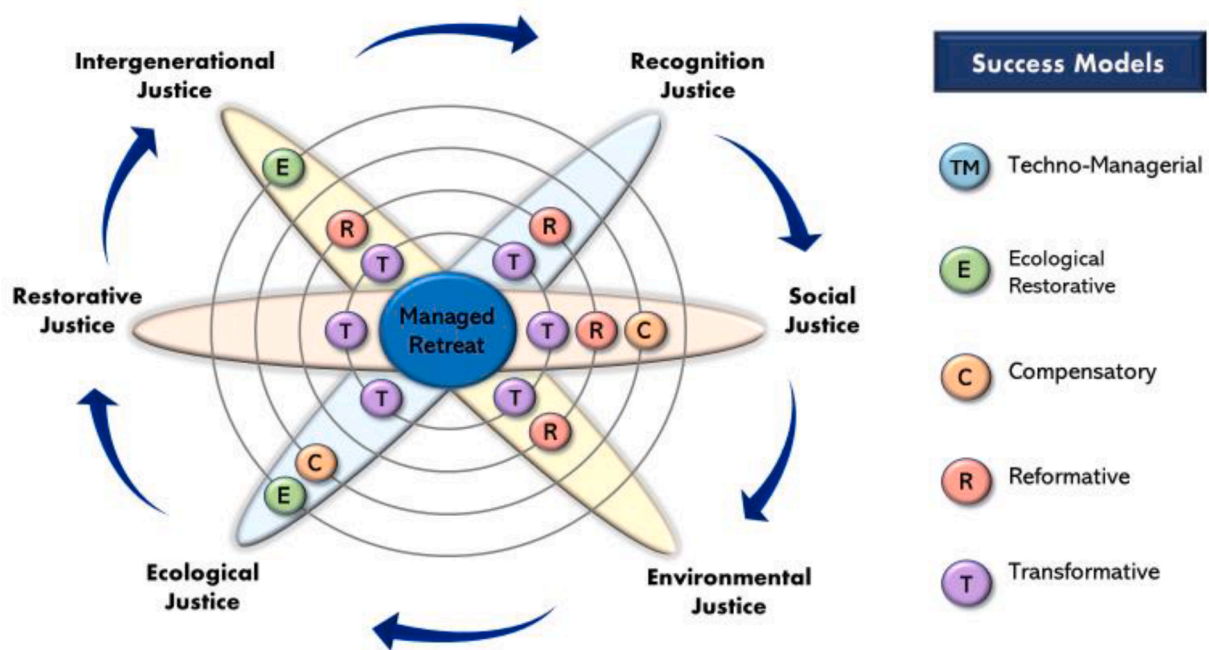


Fig. 3. Justice frameworks in successful retreat typologies.

economy processes may also shape why certain typologies and not others are evident or implemented in some countries.

5. Discussion

5.1. There is no-one-size-fits-all success model in any geographic location

The findings of this study suggest that retreat programs can be ‘successful,’ but success must be understood on a spectrum rather than as a single ideal state. The multiplicity of socio-political, cultural, environmental, economic, financial, and institutional factors that shape

retreat decisions, planning, and implementation, ultimately influence the outcomes of different programs. Indeed, there is no-one-size-fits-all success typology. Factors such as a country’s wealth, land availability, budgetary constraints, competing social priorities, political regimes, and normative values matter and may influence the retreat typology that planners, communities, and governments end up implementing. For example, the concentrations of the techno-managerial typology in Asia may be indicative of different political regime’s priority for efficiency, stricter control over land use, and/or prevalence for hierarchical power relations. This is especially true for countries where the government plays the role of planner, decision-maker, and implementer of retreat

programs (Dickinson and Webber, 2007; Wu, 2015; Xiao et al., 2018). Nonetheless, the techno-managerial typology is not exclusive to Asia as there were a few cases in Africa, North America, South America, and the Pacific Islands (Santiago et al., 2018; Funder et al., 2018; Siders, 2019b; Bergmann, 2021), meaning changes may be needed in re-centering justice and equity in retreat programs in many countries and across several continents.

5.2. Community agency, robust planning, and justice-focus increase chances of success

The compensatory, reformative, and transformative success case studies did more than reduce physical risk, they improved social, ecological, and health outcomes and access to livelihood, thereby enhancing the adaptive capacity of households and communities to deal with climate change (Okada et al., 2014; Yarina et al., 2019; See and Wilmsen, 2020; Nakelevu and Phillips, 2021). While wealth and prioritization of property rights may have played a role in the concentration of the compensatory typologies in North America and Europe (Dyckman et al., 2014; Siders, 2019a; Thaler, 2021), the concentration of transformative cases in low-income locations (Kenani, Fiji, and San Juan, Puerto Rico) suggest wealth is not the only factor that guarantees success in an expansive sense. Instead, factors such as community self-determination, robust planning, collaborative decision making, protection of land rights, maintenance of social ties, and attention to intersecting justice(s) are crucial for success (Tronquet, 2015; Yarina et al., 2019; Davis et al., 2020; McMichael and Powell, 2021). Furthermore, the majority of successful retreat programs were anticipatory as opposed to reactive. This suggests anticipatory approaches may allow for a variety of logistical, economic, socio-cultural, and intersectional justice concerns to be centered and addressed before a resettlement program is implemented as evident in the reformative and transformative cases (Tronquet, 2015; See and Wilmsen, 2020; Gini and Ramos, 2021).

5.3. Decision making processes do not predict the outcome of retreat

We found that different decision-making approaches may lead to the same or different results (Fig. 2). Community-led and polycentric decision making, for example, were observed in some techno-managerial programs (Lei et al., 2017; Albert et al., 2018). Also, some successful eco-restorative cases (Hazelden and Boorman, 2001; Sousa et al., 2020) and compensatory programs were top-down (Sider, 2019), while others were community-led (Greer et al., 2017; and collaborative (Spidalieri et al., 2020). Notably, the reformative and transformative typologies were mostly associated with community-led, collaborative, or polycentric decision-making approaches and they yielded better results for low-income communities (Tronquet, 2015; Koslov, 2016; Yarina et al., 2019; See and Wilmsen, 2020). These findings add nuances to our understanding of the role of decision-making processes, and also reveal critical shortcomings in viewing one particular decision-making approach as the pathway to success. We argue that the extent to which a program is able address different intersecting justices and reduce trade-offs may be more indicative of the likelihood of success than decision making approaches alone.

5.4. Illustrative case studies of success typologies

Techno-managerial case study (Sri Lanka and India): Following the Indian Ocean tsunami in 2004 which killed 226,408 people (Correa et al., 2011), the governments of Sri Lanka and India implemented a buffer zone policy in Hambantota and Seenigami, Sri Lanka and Chennai, India to restrict rebuilding on the coast and to resettle affected communities (Mulligan, 2017). The government led the resettlement efforts in India while local and international non-governmental organizations along with philanthropic organizations assisted Sri Lanka with its resettlement plan constructing 43,000 new houses on 387 sites

outside the buffer zone (Ahmed & McEvoy, 2014). Both resettlements involved top-down decision making with respect to site selection, planning and implementation (Ahmed and McEvoy, 2014). The lack of infrastructure and drainage systems in the resettlement sites exposed people to flooding. Transportation services were unavailable or insufficient, thus limiting relocatees' mobility and access to economic resources. Also, housing designs did not align with cultural and lifestyle aspirations of the residents and social conflict arose among community members due to inequities in access to social services (Silva and Ballinger, 2021). While these retreat programs were successful at relocating people from areas exposed to coastal flooding, only marginal improvements were reported in the living conditions of affected communities (Ahmed and McEvoy, 2014; Silva and Ballinger, 2021).

Eco-restorative case study (Germany): In Germany, the federal government funded and implemented an eco-restorative retreat program as a part of its flood defense and adaptation strategy along the shore of the Baltic Sea, Geltinger Birk in northern Germany. The project took 25 years to complete, from proposal to implementation. The discussion about resettlement began after several flood inundations occurred between 1979 and 1986 (de la Vega-Leinert et al., 2018; Schernewski et al., 2018). In 1988, the state government announced the abandonment of the old dyke citing costly repairs and maintenance. It then embarked on coastal restoration and management which included the reconstruction of a smaller dyke inland. Several forums were held to address public resistance and to quell misinformation about the program. The public nature protection foundation, Stiftung Naturschutz, purchased the agricultural land adjacent to the project to reduce public opposition. The government also hired a permanent communications manager and created an information center to respond to questions. Next, an interdisciplinary team completed an Environmental Impact Assessment over 4 years (2003–2007). The construction phase of the coastal realignment began in 2013. To encourage nature tourism, walk trails, seasonal rentals, and a herd of wild horses were introduced to the area. These steps and additional attention to ecological and intergenerational justice drastically improved the overall support of the project. After completion, the local population deemed the outcome successful (Schernewski et al., 2018).

Compensatory typology (United States): In 1995, the State of New Jersey established the Blue Acres Buyout Program (BABP) to acquire privately owned properties threatened by sea level rise and flooding. Voluntary in nature, the BABP offers homeowners pre-disaster market value for their properties while extending resettlement assistance to renters displaced by flooding. To better interface with the public and build community trust, Blue Acres assigns a liaison to each municipality who can serve as a point of contact for residents seeking advice concerning the buyout process. Blue Acres also mobilized a finance team to obtain debt forgiveness on behalf of individuals who were behind on their mortgage, thus eliminating financial obstacles for flood-prone homeowners who otherwise would not be able to participate in a buyout (Freudenberg et al., 2016). Financed primarily through state bonds and federal grants, the BABP also receives a percentage of monies collected from New Jersey's corporate business tax, an innovative funding mechanism that lessens dependence on external aid and ensures adequate reserves exist to quickly help those in need (Spidalieri et al., 2020). The emphasis on community engagement and making homeowners financially whole has been integral to the success of Blue Acres and has led to grassroots advocacy and outreach campaigns organized by satisfied residents (Spidalieri et al., 2020). Vacated land is converted into recreational zones that allow for better flood buffering and ecosystem revitalization. To date, Blue Acres has purchased over 700 properties statewide and negotiated nearly \$6 million in debt relief for people owing more than their home is worth (Hurdle, 2019). With its focus on fostering collaborative relationships between state and municipal actors, and its commitment to robust public engagement, Blue Acres is a standout model for how buyout programs can significantly improve the lives of at-risk residents and the ecosystems they depend on,

thus combining social and ecological justice to advance the resettlement of communities.

Reformative typology (Brazil): Located on Cardoso Island near the coastline of southeastern Brazil, the Enseada da Baleia community is home to the Caiçaras people who are the traditional inhabitants of the region. In 2016, Enseada's inhabitants were forced to relocate after a tidal undertow reduced their settlement on Cardoso Island near the coastline of southeastern Brazil to a narrow strip of sand jutting between an estuary and the open ocean (Gini et al., 2020). State and local authorities were reluctant to move the Enseada's inhabitants elsewhere on the island, since most of the land was part of a natural preserve sequestered for conservation and ecotourism. Consequently, state officials proposed two solutions: resettle the villagers to the periphery of a nearby city or integrate them into another community. The Enseada community rejected both options believing they would disrupt the Caiçaras socio-political organization and the community's traditional lifestyle and relationship to the land. The Enseada women, who had organized the community around feminist emancipatory approaches in economic and political life, challenged the State's recommendations by successfully suing for the 'right to a self-organized resettlement' which guaranteed their community could remain on the island. The Brazilian government responded to Enseada's legal victory by refusing to offer financial support for the resettlement (Gini et al., 2020; Gini and Ramos, 2021). Under the leadership of Enseada's women, the community engaged with researchers and park managers to identify a resettlement site that was geographically safe and would meet the material and spiritual needs of Caiçaras culture, thereby maintaining their attachment to place. To overcome the lack of state funding, Enseada women hosted several *mutirões* which are communal events that bring tourists and neighboring villages together under a shared goal of mutual aid and free labor. Gifts of lumber and other supplies were transported to the new site from multiple donors, energizing the men and younger residents who saw the resettlement process as a pathway for social renewal and an opportunity to learn new skills. Ultimately, through fundraising, the sale of artisanal crafts, and two months of *mutirões*, Enseada was able to cover the construction costs with housing priority given to the most vulnerable. Dubbed Nova Enseada, the new village is seen by its residents as an act of resistance against the State's abandonment and illustrates how collective mobilization and local economies can be important elements of successful retreat (Gini et al., 2020; Gini and Ramos, 2021). The solidarity-based strategies and leadership of Enseada's women underscore how resettlement projects grounded in feminist-driven approaches can produce a just and egalitarian resettlement.

Transformative typology (Puerto Rico): The in-community retreat of El Caño Martín Peña in San Juan, Puerto Rico, offers an example of a transformative resettlement. This El Caño community, like many in greater San Juan, was settled informally due to a mid-20th century housing crisis. By the turn of the century, they faced not only the risk of development-induced dispossession, but also increasing flooding and public health concerns due to encroachment on the channel that connects the eight communities that form the neighborhood. These problems motivated the resettlement of 600 households (Yarina et al., 2019). Residents are resettled within the same community to a flood-adapted infill affordable housing with reduced flood risk. The retreat made way for a green infrastructure, improved public health and sanitation, and ecological restoration allowing residents to retain social ties and access to livelihoods in central San Juan (Sheffield et al., 2014; Davis et al., 2020). The ecological impacts of the program extend beyond the site, El Caño, to the whole city of San Juan by creating recreational spaces and expanding stormwater and wastewater sewer systems. The resettlement was voluntary, decision-making was collaborative and there has been strong community buy-in because of the extensive grassroots engagement throughout the project (Yarina et al., 2019). Funding and logistical support for the resettlement came from multiple sources, including the US Environmental Protection Agency, US Congressional appropriation, and a UN World Habitat Award (Ovalles

et al., 2021). The creation of a community land trust (CLT), the Fideicomiso de la Tierra del Caño Martín Peña, helps to protect residents from displacement and gentrification through collective ownership (Davis et al., 2020). A community coalition, the G8, provided leadership while the public corporation ENLACE fostered community solidarity and democratic planning processes with a substantial representation of women and youth leaders (Algoed and Hernández-Torrales, 2019; Davis et al., 2020). Participants described the retreat as successful because it helped relocatees feel a greater sense of belonging along with improved social connections, secure housing tenure, and retention of place attachment. The project's attention to recognition, social, economic, environmental, and restorative justice; grassroots organizing; community empowerment and youth development through social and educational programs and activities makes it an exemplary case study. Today, the Caño CLT model is shared by community participants through horizontal knowledge networks with an emphasis on its potential for empowering informal communities around the globe (Davis et al., 2020).

5.5. Limitations

We admit that there are limitations to relying on existing case studies to make a judgment call on the success of relocation programs. The perspectives of the authors of the studies (whether local scholars or outside experts) may shape what is being reported, amplified, or silenced. There are also challenges with determining whether what is published aligns with communities' determination of success. To minimize potential biases in reporting and increase reliability, rather than rely on a single author, we reviewed multiple academic and [supplementary materials](#) for each case study, cross-referencing and updating our codes and findings with new information. We also reached out to the authors of some of the papers analyzed and attended public virtual meetings where community members shared their personal experiences about their resettlement process and outcomes (the first author did so in the case of Puerto Rico and Brazil). Furthermore, we admit there are methodological issues with categorizing such a large scope of geographical, cultural, and political cases into five success categories. Indeed, contextual differences were found in the cases studies clustered within each typology despite shared commonalities. Therefore, we do not consider these categories as the only observable success typologies and encourage other researchers to build on this study in future research.

6. Conclusion

In the past four decades, researchers, adaptation practitioners, policy makers, local communities, and the media have raised concerns about failed retreat programs and questioned whether retreat can be a tool for just adaptation and sustainable redevelopment. This study addresses this important question through a rigorous analysis of post-resettlement case studies documented across the world. By examining a variety of metrics that shape goals, actions, processes, norms, and outcomes, we identified sixty successful retreat cases divided across five typologies: techno-managerial, eco-restorative, compensatory, reformative, and transformative. Each typology has its benefits and drawbacks as well as factors that shape their prevalence or implementation in different countries and contexts. The techno-managerial typology allowed for the resettlement of a large number of people within a short-period of time but its minimal attention to equity and justice and unfavorable outcomes, reduces its legitimacy. Yet, this typology was the most prevalent globally, and often used to relocate low-income groups. The eco-restorative typology showed retreat can also be a strategy for restoring the fraught relationship between human and nature by fostering ecological and intergenerational justice. Although, this typology could be used to displace people in less democratic countries, thereby undermining social and environmental justice. The compensatory typology supports social

justice by giving individuals and households the autonomy in securing safer housing in preferred resettlement destinations. However, the concentration of such programs in wealthy nations underscores the global inequality in access to financial resources to boost resettlement-related adaptations. A high proportion of the reformative typology and the concentration of the transformative programs in poor countries proved communities in such countries are showing exemplary leadership in the safe resettlement of those exposed to climate risks. In these cases, success was propelled by strong community participation and capacity building, robust planning, support for rootedness, adequate funding, increased social safety nets, secure housing tenure, acceptance of trade-offs, and attention to multiple and intersecting dimensions of justice: recognition, social, environmental, restorative, ecological and intergenerational.

By developing these analytical tools, this study advances a clearer understanding of the viability of retreat programs and the factors that contribute to success or failure, thus allowing for mutual learning across locations, countries, and continents. While success will always be a relative, fluid, and politically contested concept, we argue that evaluating the success of retreat programs enables society to consider new possibilities of how climate-induced relocations might contribute to climate justice not only by avoiding or reducing harms but by ensuring sustainable development, improved livelihoods, and community well-being. The fact that the techno-managerial typology was the most prevalent globally means a paradigm shift in retreat policies, planning, and implementation is urgently needed. Planners and policy makers, in particular, are challenged to shift their priorities away from cost-benefit and efficiency-based metrics towards more justice-oriented approaches that center human dignity, livelihoods, equity, and overall wellbeing of communities in relocation programs. We argue that by centering intersectional justice as the axis around which relocation is planned, retreat can become a strategy for redressing past inequities while laying a foundation for multiple futures that elevates the voices of marginalized groups and communities who are most affected by climate change.

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CRedit authorship contribution statement

Iidowu Ajibade: Conceptualization, Visualization, Methodology, Writing - original draft, Writing - review & editing. **Meghan Sullivan:** Conceptualization, Methodology, Visualization, Writing - review & editing. **Chris Lower:** Conceptualization, Visualization, Methodology, Writing - review & editing. **Lizzie Yarina:** Conceptualization, Writing - review & editing. **Allie Reilly:** Conceptualization, Writing - review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.gloenvcha.2022.102576>.

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