Learning About the Health and Wellbeing Impacts of Coastal Planned Relocation in the US and Japan

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Abstract

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Purpose of the Study:

The effects of climate change (e.g., storm surge from extreme weather events, sea level rise) and other coastal hazards (e.g., earthquakes, tsunamis, land subsidence) are posing existential threats to coastal communities, resulting in a push for community-level changes. Some of these communities are considering "planned relocation," "managed retreat," or "uphill expansion." For instance, the 2011 Great East Japan Earthquake and tsunami prompted many communities to relocate inland, while in the Pacific Northwest, some communities on the Pacific Coast are in the process of relocating due to coastal erosion, sea level rise and anticipated tsunamis. Despite these experiences around the Pacific Rim, comparative studies of hazard-adaptive relocation are rare, especially when relocation is collectively planned rather than individually enabled, e.g., through buyouts which have been demonstrated to exacerbate social inequality and vulnerability. This study identifies information that researchers, practitioners and relocating community members

need to know about the health and wellbeing impacts of planned relocation, in order to evaluate planned relocation as a disaster risk reduction strategy.

Design and Methods:

Semi-structured interviews were conducted with a purposive sample of 15 planned relocation scholars in the United States and Japan, with perspectives represented from urban planning, public health and disaster science, and architecture. Interviews were audio-recorded and professionally transcribed. A combined inductive and deductive approach was used to code and thematically analyze the data.

Results:

Participants stated that there is a poor understanding of the impacts of planned relocation due to a lack of data availability. From the participants' perspectives, relocation has the potential to impact quality of life in both positive and negative ways, including career, cultural, housing and environmental displacement. Participants indicated that planned relocation has interconnected impacts on the individual, social, built and natural environments. Individual agency in the relocation process is mediated by individual and social characteristics and is central to the impacts of relocation on environmental conditions. Social connectivity and anchor institutions are necessary for a positive community relocation experience. Multidisciplinary relocation approaches, which prioritize input from practitioners, researchers and community members, can positively affect relocation outcomes, allowing for physical safety, community needs and environmental protection to be considered in relocation planning and implementation.

Conclusion:

More information on individual, social, built and natural environmental impacts of planned relocation, as well as supports necessary to enhance partnerships, were found to be necessary for

successful future relocation strategies, including the need for co-production and agency throughout the relocation process. Future research should explore long-term impacts of planned relocation on individuals and communities in the context of physical, social and environmental wellbeing, and evaluate the impacts of external support and equitable use of resources to minimize risk.

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Introduction

Climate Change Impacts & Mitigation Strategies

Climate change impacts and hazards experienced by coastal communities have grown to a concerning frequency in recent decades, with no projection of slowing. Sea level rise alone threatens to displace 72-187 million people globally by 2100 [1]. The implications of this potential global catastrophe have been the subject of discussion and many attempts at mitigation. The methods used by local, state, and federal governments around the world vary, ranging from the restoration of coastlines and wetlands [2], to the fortification of coastal communities by engineering seawalls, levees, and other mechanical measures [1]. Despite the relative success of certain measures, such as coastline restoration initiatives that utilize restored salt marshes as barriers to sea level rise and storm surge [2], the future impacts of extreme weather events may be too substantial for these types of intervention methods to control. Moreover, attempts by governments across the globe to fortify coastal communities against extreme weather events and other hazards have led to the counterproductive "Levee Effect," where fortification motivates advanced development of fragile infrastructure in at-risk locations, further increasing a community's vulnerability [1].

In the case of extreme weather events and damaging storm surges, the most common mitigation strategy for communities in the United States is the use of government assisted buyouts [3]. Buyout-enabled relocation has been demonstrated to exacerbate social inequality and vulnerability [4]. Buyout retreat plans are subject to personal bias or political ambition of those in charge of their implementation, potentially leading to social inequalities in the retreat process and long term outcomes [4]. Even when locations for buyout-enabled relocation programs are conducted with beneficence in mind, the parameters that qualify communities for

government funded buyout programs may subjugate low-income and minority communities [4, 5].

In the Pacific Northwest alone, the risk of sea level rise and heightened storm surges has increased in intensity, with estimates of sea level rise ranging from 0.1 to 1.5 meters along the Pacific Northwest coast [6]. The Pacific Coast of Washington has populations concentrated in areas susceptible to these hazards, with 48% of Washington's population at risk of tsunami impacts and associated displacement concentrated in two coastal counties [7, 8]. Given the severe consequences of sudden extreme events and unavoidable changes anticipated in the Pacific Northwest and around the globe, there is an increasing recognition that a more comprehensive approach is required for the safety of coastal communities.

Planned Relocation & its Social Impacts

Planned relocation, also known as managed retreat or uphill expansion, is the "strategic relocation of structures or abandonment of land to manage natural hazard risk," [1, 9]. Compared to engineering mitigation measures, retreat generally has fewer costs, permanently mitigates the risks associated with sea level rise and tsunami occurrence, and lessens the impact of extreme weather events on communities [1]. Despite the fiscal and safety benefits, planned relocation is rarely used as a mitigation strategy except in the most extreme situations. On March 11th, 2011, a magnitude 9 megathrust earthquake occurred off the Northeast coast of Japan, generating a tsunami that killed 15,894 people and destroyed 130,000 homes [9]. The level of human and environmental loss in the aftermath of this event led the Japanese government to support the implementation of a more extreme measure of recovery, with the collective relocation of affected communities becoming the most extensive planned relocation undertaking known today [9]. The relocation of communities in tsunami-affected regions along the coastline included various

projects, such as preparation of new residential lots for 18,000 houses, and allocation of close to 30,000 units of disaster recovery public housing outside the tsunami hazard zone for survivors [10].

However, planned relocation is a controversial strategy because of its potential for cascading socioeconomic, health and wellbeing impacts. While there is very little research on these consequences, the few well-documented cases of planned relocation provide insights into how divergent approaches impact the social and economic fabric of communities, with the relocation after the Great East Japan Earthquake and resulting tsunami being one of the most poignant examples [9]. Despite the engineering and structural success of the post-tsunami relocation, the planning and implementation of these varied relocation projects did not always consider or address issues related to the health and wellbeing consequences of moving entire communities away from their original homes [9]. For instance, one of the additions made to the coastline as part of this planned relocation process was the construction of "the Great Wall of Japan"; a massive seawall and tsunami protection system that stretches along 457 km of coastline in northeast Japan [9]. While this infrastructure was implemented to better protect recently relocated communities, many residents, environmentalists and coastal scientists resisted its construction, citing concerns about degradation of the coastal ecosystem and residents' access to the ocean [9]. Around the globe, limiting coastal communities' access to the ocean has been documented to impact their economic vulnerability through impairment of fisheries and tourism as well as affecting social characteristics associated with close proximity to the water [11].

In another example, a multi-year study of relocating residents of the coastal village of Vunidogoloa, Fiji, in closer proximity to the urban area of Savusavu, identified risks to the community's social stability introduced by relocation. Social impacts included disruption to the

community's traditional values, cultural identity and considerations related to place attachment as residents moved away from their original coastal location, which disrupted their ability to reach their ancestral fishing and burial grounds [12]. Additionally, study participants emphasized that their community's agency and social capital suffered as a result of relocation [12].

Planned Relocation & its Environmental Impacts

Beyond the social impacts of communities undergoing planned relocation, there are critical built and natural environmental impacts of relocation that have become evident. Communities undergoing planned relocation have emphasized that new and adequate housing was a primary concern, with the quality of housing being determined by how the relocation effort was being financially supported [13]. While residential displacement at any level increases the probability of negative impacts to social determinants of health [14], many "receiving communities" (i.e., communities in lower risk areas that accept residents from relocating communities) [15] may be unprepared to meet housing needs. Healthy housing is crucial, and may impact a household's physical and mental wellbeing and access to health-promoting infrastructure [16] necessary to the success of planned relocation.

Additional environmental concerns affecting communities undergoing relocation include those related to food security and dietary change. While moving away from encroaching sea water and soil erosion may improve a community's capability to farm or source nutritious food supplies, there is the possibility that the shift of food sources may impact communities' traditional diets [12, 13]. In the case of Vunidogoloa, Fiji, relocated residents described how their nutrient-rich traditional diet was supplemented with processed and packaged foods after their relocation to an urban-adjacent region. This change in diet has been attributed to a change in the

health of their community members, with notable increases of tooth decay and type 2 diabetes [12].

Planned Relocation's Potential Health Impacts

As health is determined by an individual's social and physical environment, the aforementioned impacts of relocation may have cascading health and wellbeing consequences. For instance, impacts to a community's cultural identity, economic stability and social agency may affect individual and collective mental health within the community, while changing infrastructure, access to reliable food sources and environmental quality may affect the community's health overall [13, 17]. Indeed, relocating communities have expressed concerns around pliability of their new home to support the places, spaces, and systems that facilitate their health, whether they be physical, cultural, or environmental [13].

Concerns About the Future of Coastal Communities

Prior approaches to planned relocation have been criticized for using a "climate gap" mentality, where plans focused on the physical, ecological, and economic impacts while remaining disconnected from the community's cumulative needs and cultural fabric [17]. Moreover, the use of structurally-focused tactics has been attributed to disproportionate effects on low-income and minority populations [13]. Given the potential for inequitable impacts of coastal hazard mitigation and adaptation strategies, it is vital for planned relocation practitioners to understand and mitigate any potential risks and inequities that may diminish the intended result of their relocation strategy.

Despite the increasing need for more holistic approaches to coastal hazard mitigation, there are limited successful examples of planned relocation, resulting in a significant lack of scientific knowledge about health and social impacts. With the anticipated increase in sea level rise and extreme weather events, along with the seismic and tsunami risks faced across the Pacific Rim, it is imperative to understand the information needs of coastal community stakeholders and advisors as related to the health and wellbeing impacts of planned relocation, and to identify opportunities to learn from the knowledge of communities, like those in Japan, that have already undergone relocation.

Rationale of Approach

This study identifies information needs about tangible and perceived health and wellbeing impacts of planned relocation in coastal communities. This information can be used to catalyze research that can inform coastal community preparedness and planning to mitigate these issues during the relocation process. The use of qualitative semi-structured interviews elicited social and cultural perspectives on decisions that had previously been dominated by engineering considerations [18]. This research design also allows for the flexibility needed when researching a topic that is relatively novel and highly contextual [18]. It provides the researcher with the ability to accommodate new and unexpected information into the research design as the project progresses.

This project employed the Socio-Ecological Model (SEM) as a framework for the interview guides and thematic analysis. This framework has been used for a variety of health initiatives and research purposes since its conceptualization by Urie Bronfenbrenner in the 1970s [19]. The framework was adapted from the Person-Place-Context-Time (PPCT) Model, an

ecological systems theory that views the culmination of an event as a system of relationships between the surrounding environment, including the microsystem (e.g. family, peers and direct influences), the mesosystem (e.g. interactions between aspects of the microsystem), the exosystem (e.g. the incorporation of formal and informal social structures such as communities and workplaces), and the macrosystem (e.g. cultural elements such as socio-economic status, ethnicity and beliefs) [20]. This model emphasizes the societal factors that influence public health compared to that of targeted proximal processes and personal characteristics [20]. The SEM is in essence a simplified version of the PPCT model, facilitating its use in public health research and initiatives [19].

The version of the SEM that was used in this study considered how individual, social, built and natural environmental factors influence health, adapted from [Daniel Bornstein] [19, 21].

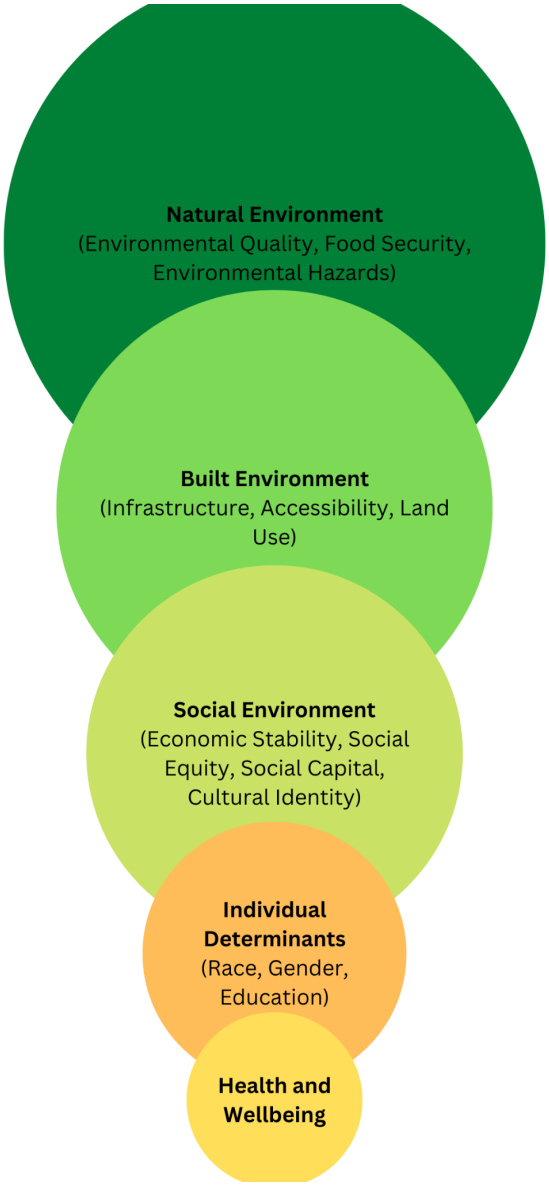

Image 1. Socio-Ecological Model Representing the Health and Well-being Impacts of Planned Relocation. Adapted from: Bornstein, D., & Davis, W. (2014, 07/01). The Transportation Profession's Role in Improving Public Health. Institute of Transportation Engineers Journal, 84, 19-24.

For this study, we explored how the process of planned relocation is known or perceived to influence each of these domains, and for whom, as well as gaps in available information as it pertains to understanding their impacts on health. By systematically collecting perspectives about

knowledge gaps using the SEM, we were able to identify commonalities in information needs and priorities related to each domain and how they interact.

Methods

Study Design

The study used a descriptive, cross-sectional design using semi-structured interviews to identify information needs surrounding the health and wellbeing impacts of the planned relocation process in the United States and Japan.

Participant Recruitment

Study participants included planned relocation scholars and professionals from fields including Public Health (environmental, global health and disaster science), Urban Planning, Architecture and other related fields. Participants had either been a part of planned relocation planning or implementation or had conducted research within communities that had or were currently undergoing the planned relocation process. Due to the lack of current research surrounding the health impacts of planned relocation, the focus of their expertise or experience included any aspect of planned relocation related to a domain of the SEM.

Recruitment was conducted through email by the principal investigator. Participants were identified through the literature review and recommendations from University of Washington faculty. Purposive sampling, a method of sampling used to identify information-rich cases in a limited population [22] and snowball sampling, a method of sampling in which study participants assist researchers in identifying potential participants [23], were used to identify participants. Inclusion criteria for the interviews required that these scholars and professionals had published research focusing on planned relocation or worked in the field with communities during planned

relocation processes, and were knowledgeable about public health concepts. Priority was given to persons located in the two study locations, the United States and Japan.

Data Collection

Data was gathered through semi-structured interviews. Interviews were conducted to reach "data saturation" in which informational redundancy occurs: when information provided by interview participants is redundant, and the researcher perceives that additional interviews are unlikely to elicit new themes [24].

The SEM was used to develop the semi-structured interview guide used for these interviews. It explored what planned relocation scholars had observed through their own work and research as it related to gaps in available information regarding health and wellbeing considerations in communities planning or implementing relocation. These interviews used a semi-structured approach, including main questions, follow-up questions and probes, to ensure that the research questions were fully addressed during the interview [25]. The interview guide leveraged the SEM to explore the individual, social, built and natural environmental domains to identify perceived information needs [19, 21]. The interview guide was piloted by one participant that met the inclusion criteria to assist in clarification and improvement of the guide. The interviews were conducted virtually and designed to last approximately 30 minutes to one hour. The interviews were audio recorded with consent from interviewees. Interviews were conducted in English and transcribed using the professional transcription company, TranscribeMe.

Data Analysis

Both inductive and deductive approaches were used throughout analysis [26]. To begin data analysis, a preliminary codebook was developed with primary and sub-codes based on the

interview guide and SEM. Interview notes and transcripts were then read and key themes, quotes and observations were recorded. Using these new observations, the codebook was condensed. Codes were given definitions, examples and nicknames that simplified the coding process. The codebook was an evolving document; therefore, any changes were recorded in a separate document, with the original versions of the codebook kept intact. A sample of the interview data was double coded by two researchers to improve codebook reliability. The remaining interview data was coded by the primary investigator. NVivo qualitative data analysis software, available from QSR International Pty Ltd., was used to assign codes to the data. Member-checking, a technique in which data and results are returned to participants and checked for accuracy [27], was conducted to verify the validity and context of findings. A summary of key takeaways from interview transcripts was sent to participants after their interviews were complete, allowing for an opportunity to provide feedback or make corrections.

Thematic analysis was used to analyze the interviews. The thematic analysis focused on the main concerns from interviewees and translated them into a more comprehensive list of research needs. The Framework Method was used to conduct thematic analysis [28]. Following the process of the Framework Method, transcripts and interview notes were used for familiarization of the interview data, then allowing for coding, in which two researchers read through two transcripts using both inductive and deductive coding processes [28]. An analytic framework was then developed through finalizing the codebook [28]. The analytic framework was then applied to the remaining transcripts, allowing the framework to evolve as new codes emerged and new relationships were discovered [28]. For each code, an interview summary memo was created that synthesized key points from each interview. Interview-level summaries were entered into a table (i.e., a matrix) to be able to compare and contrast key points across

interviews. Based on this analysis, a code-level summary memo was created, synthesizing key themes and counterpoints across interviews within that code. Throughout the process, data that emerged from the transcripts was interpreted, with established research questions and the project proposal being used to guide the discovery of salient themes [28].

Results

Interviews

Fifteen interviews were conducted on Zoom between January 12th and February 14th, 2023, with interview lengths ranging between 23 minutes to 1 hour. Interviewees were affiliated with academic institutions within the United States (10) and Japan (5), with expertise in urban planning (8), public health and disaster research (6) and architecture (1).

From these interviews, key themes were identified within the domains of individual impacts, social impacts, built environment impacts, and natural environment impacts. The following tables expand upon these themes and provide supportive participant comments.

Individual Impacts

Table 1. Individual Impacts of Planned Relocation

Individual Impacts	**Elements of Participant Discussion**	**Participant Comments**
Place-based Impacts	The shifting of routines can enhance the instability of people's livelihoods and wellbeing. Buyouts may require individuals to relocate further due to financial instability. Relocation could benefit or worsen experienced stress.	*"In a short plan, many people are eager to relocate from the place where they lived, which has very bad experiences or bad memories." - Participant* 4^{JP} *"Also, the shift from traditional dependency on a traditional life which included dependency on land-based systems and food systems." - Participant*

		11^{US}
Individual Agency	Individuals who had less agency may be more likely to feel isolated during and after relocation, impacting the success of the relocation process.	*"And I think it could be because maybe they feel like they have less choice, less agency over it because they're feeling forced out by climate as opposed to feeling like they chose it for whatever reasons. " - Participant* 3^{US}
Age	Older adults may have a more difficult time during and after relocation compared to younger individuals.	*"So we know that age correlates a lot with willingness to move in general, so it will certainly play a role." - Participant* 3^{US}
At-risk Groups	Vulnerable groups are impacted by relocation the most. Job transferability, education, gender, and culture may impact the ease and success of relocation measures.	*"So, if you are younger, if you are more educated, if you have a higher income, if you have more wealth, then you have decision-making power. You don't have to wait for your insurance settlement. You don't have to wait for a government-sponsored relocation program." - Participant* 1^{US}

Nearly all participants stated that there is a poor understanding of the individual impacts of planned relocation because of the lack of available data, though from these participants' perspectives relocation will impact quality of life in both positive and negative ways.

Place-based Impacts

Most participants shared that shifting of individual routines could enhance the instability of people's livelihoods and wellbeing. One participant shared that this could occur in ways such as losing access to job sites, healthcare providers and other resources (Participant 4^{JP}). Others described that income loss associated with relocation-related job loss could require individuals to rely on processed foods to fill nutritional gaps (Participant 4^{JP} & 11^{US}), and "shift from traditional dependency on land-based systems and food systems," (Participant 11^{US}).

In the United States, where buyouts are the mainstream method of relocation, even if people are able to get the pre-disaster compensation for their home, it may not be enough for most to find an equivalent home elsewhere. This was described to lead people to relocate further or into an area with environmental risks to find cheaper housing (Participant 9^{US}& 11^{US}). In order to avoid these risks, individuals may be required to spend more on housing costs, reducing their disposable income to pay for other crucial services that support their health and wellbeing (Participant 10^{US}).

Three participants discussed how the relocation process could have both positive and negative effects on an individual's ability to cope with post-traumatic stress disorder (PTSD) associated with the antecedent event for relocation. It was described that while relocation may be used by some as a method to cope by removing the individual from the area where a traumatic event occurred (Participant 6^{JP}), it could also exacerbate PTSD through the drastic life changes incurred during the relocation process (Participant 3^{US} & 7^{JP}).

Individual Agency

Most participants emphasized the role of individual choice in determining health or wellbeing impacts of relocation. Those who had less agency were described to be more likely to feel isolated during and after relocation, impacting the success of the relocation process. Individuals being kept in "limbo," (Participant 7^{JP} & 14^{US}), and individuals experiencing disappointment when relocation conversations with government facilitators plateau, may have negative mental health impacts and increased stress (Participant 11^{US} & 14^{US}). Another participant discussed feelings of disenfranchisement, especially among indigenous individuals who may have been forced by the government onto lands which are now being designated as

unsafe (Participant 14^{US}). For example, an Alaskan native village was "forcibly moved onto an eroding barrier island," by the United States government (Participant 14^{US}), but the government's "obligation has not manifested in any kind of tangible relief" (Participant 14^{US}). In addition, the litigation process, which may be especially difficult for indigenous persons who may not use Western litigation or knowledge systems, may result in additional stress (Participant 14^{US}).

Age

It was noted by a few participants that an individual's age correlates with their willingness to move, and older adults may have stronger attachment to their original community depending on how long they had lived there (Participant 3^{US}). Additionally, older individuals' physical mobility could impact their ability to relocate. Older individuals may feel more vulnerable and fearful of relocation because they may have a harder time finding a new home that can accommodate their physical needs and/or disabilities and may be fearful over their inability to leave their current home without assistance (Participant 3^{US} & 15^{US}). On the other hand, some older individuals may feel less stress about a planned relocation if they perceive it will not occur in their lifetime (Participant 3^{US}).

About half of participants described an inverse association between age and agency. Younger individuals may be better positioned to find new or different employment and may have more financial capacity to find a new place to live compared to older adults with fixed incomes (Participant 7^{JP} & 15^{US}), and are better equipped to adapt to new environments. Older individuals, reliant on resource networks, may have a harder time finding the resources they need, from healthcare providers to groceries (Participant 8^{JP}). This can lead to isolation

depending on where they may be relocated and what resources they have access to (Participant 6^{JP} & 7^{JP}), especially those moving to larger urban areas (Participant 6^{JP}).

At-risk Groups

Most participants described disproportionately negative impacts of relocation among specific vulnerable groups, including individuals with low incomes, older adults, racial and ethnic minorities, immigrants, people with disabilities and single parents. Individuals who have more financial and political resources are better equipped to determine their relocation measures, as they do not have to wait for government assistance to relocate (Participant 13^{US}). A few participants mentioned that individuals with children were more likely to have better relocation outcomes because they were more likely to be exposed to a new community through their child's school, doctor and other outlets (Participant 6^{JP} & 7^{JP}).

Nearly all participants stated that job-transferability following relocation was occupation-specific, especially among occupations that may be reliant on the landscape (Participant 2^{US}, 5^{JP}, 6^{JP}, 7^{JP}, 14^{US}). Unlike occupation, a person's education level may not impact the relocation outcomes as much as might be expected. It was observed by some participants that trade skills and other occupations that did not require extended education were especially important during relocation, including carpenters and craftsmen (Participant 4^{JP}).

Participants also discussed the gendered impacts of relocation. One participant described that relocation discussions are often dominated by men, despite women's significant roles throughout the process (Participant 11^{US}). Additionally, differences in mental health impacts have been observed between men and women. A participant from Japan explained that single men who resided in public housing after relocation felt the impacts of isolation far more than

women, as women were more likely to pursue new networks. Men, on the other hand, were described to have felt less capable and turned to other methods to cope with the isolation, including alcohol use (Participant 6^{JP}).

A quarter of participants discussed how indigenous knowledge played a role in relocation outcomes (Participant 4^{JP}, 9^{US}, 14^{US}). One participant shared an example from an Alaskan native village, where individuals dually educated in traditional and Western knowledge were "more likely to ask questions, speak up distrust, demand, eloquently articulate their rights" (Participant 14^{US}), and prevent themselves from being overlooked by organizers (Participant 14^{US}).

Information to Consider for Successful Relocation

One participant discussed that to improve relocation outcomes for individuals, there needed to be enough time and information available to prevent isolation and improve their perception of agency (Participant 11^{US}).

Social Impacts

Table 2. Social Impacts of Planned Relocation

Social Impacts	**Elements of Participant Discussion**	**Participant Comments**
Community Population and Timing	Community relocation can impact social capital and structure, as well as impact a community's social functionality. It takes time to rebuild social connections after relocation.	*"They were having a hard time integrating into their new community or finding stable housing or new jobs or whatever it was. But things were bad. And then after that, things got better. And it sort of makes sense just from a logical standpoint, right? You're displaced. It's going to take a while." - Participant* 3^{US}
Importance of Social	Anchor institutions are important for a successful	*"And then what are the anchor institutions that are serving as the*

Institutions	community relocation. Changing anchor institutions and facilities may impact resource availability and stability.	*connecting fabric for those communities? Is it religious institutions? Is it the local bar? What are those anchors that can-- are connecting people together."* - *Participant* 10^{US}
Changing Living Situations	Relocation-induced changes to living situations were described to impact social capital.	*"They live in a housing complex. So five stories, six stories, seven stories, and so the-- each unit is very isolated compared to at least compared to detached houses or detached housing."* - *Participant* 6^{JP}
Impacts of Changing Site Characteristics	Finding sites with similar natural and cultural characteristics after relocation can be challenging. Distance of a relocation can restrict community access to cultural and spiritual facilities. New sites could introduce new risks to financial and food security.	*"And there's a lot of tension between being a geo-technically appropriate site, identified by the Army Corps, and being a culturally appropriate site that the community has warned may not be a livable place."* - *Participant* 14^{US}
Changing Cultural Abilities	Any time large groups of people are moved, there can be unintentional changes to community culture.	*"So, the population in the original community becomes only 10%. So that the 90% of the people left the original community, even though they had the option of staying in the original community. So, population-wise, it gives a very big impact on culture."* - *Participant* 4^{JP}

Community Population and Timing

Most participants discussed how relocation of individuals to an existing community would change both the relocated and the existing community's social capital and social context (Participant 2^{US}, 6^{JP}, 9^{US}, 10^{US}, 11^{US}, 14^{US}). A third of participants described that certain communities have an easier time maintaining their social capital and social structure despite the relocation process (Participant 3^{US}, 6^{JP}, 9^{US}, 11^{US}). Even with community-level relocation, there

is the possibility that there could be disruption of social networks if those who relocated moved too far from the original location. Those who were left behind after a relocation could have deleterious impacts to their quality of life due to the damaged social networks as well as depopulation. As one participant shared, "If 90% of people have left the original community, then the 10% left will have to deal with significant impacts to the community's functionality and local practices," (Participant 4^{JP}). Another noted that individuals with unstable social networks may have more difficulty even initiating a relocation process (Participant 10^{US}).

Three participants described the time it takes to develop new social networks following relocation (Participant 1^{US}, 3^{US}, 15^{US}). One participant recounted an example from New Orleans, in which "Three years after relocation, those who relocated were at their worst. They were having to integrate into their new community and find stable housing and jobs, but things got better," (Participant 3^{US}).

Importance of Social Institutions

Two participants described how housing-centered relocation approaches often ignored the importance of community assets, sometimes called anchor institutions, such as YMCAs, faith-based organizations, or local businesses (Participant 1^{US} & 10^{US}). One of these participants suggested that the transition of brick and mortar facilities within communities to mobile facilities may facilitate a community's accessibility to such resources; however, if communities do not relocate together, some may be left behind without access to these resources (Participant 10^{US}).

Changing Living Situations

Half of participants described how relocation-induced changes to living situations impacted social capital (Participant 1^{US}, 3^{US}, 6^{JP}, 7^{JP}, 10^{US}, 14^{US}, 15^{US}). One participant

described an example from Japan, where relocated persons who ended up living in government-funded apartments became more socially isolated compared to the open, single story homes in neighborhoods that they had previously resided in (Participant 6^{JP}).

Impacts of Changing Site Characteristics

Nearly all participants described challenges of identifying relocation sites that shared similar natural and cultural characteristics as the original community (Participant 3^{US}, 4^{JP}, 6^{JP}, 9^{US}, 11^{US}, 14^{US}, 15^{US}). Furthermore, relocation to sites far in distance from original communities could impact access to important cultural sites and heritage. For example, communities relocated after the Great East Japan Earthquake and Tsunami lost access to religious facilities and shrines, with cascading impacts to mental health and wellbeing (Participant 7^{JP}). Furthermore, two participants described how plans for new built environment designs that prioritize public health and safety may create unforeseen risks to a community's social and cultural needs (Participant 14^{US} & 15^{US}). Two participants discussed how land use, such as for wetlands or a park, could allow the community to remain connected in less risky ways to their original location (Participant 3^{US} & 15^{US}). Additionally, use of traditional design in relocation sites could improve cultural and spiritual community characteristics (Participant 4^{JP} & 9^{US}).

A third of participants also described how relocation to areas with different characteristics could impact residents' financial stability, as well as worsen their access to traditional foods (Participant 4^{JP}, 6^{JP}, 10^{US}, 11^{US}, 14^{US}), by losing access to fishing sites or farmlands, for example. Others described that communities with deeper place-based and social attachments may experience more negative impacts from relocation. For example, in Washington

state, tribal communities may experience more impacts compared to urban communities who may be wealthier, have looser community ties and may not originally be from the area (Participant 9^{US}). Comparatively, tribal communities who have a long standing attachment to the land may have fewer resources for relocation (Participant 9^{US}).

Changing Cultural Abilities

Nearly half of participants stated that any time large groups of people were moved, there would be an unintentional change to community culture (Participant 3^{US}, 4^{JP}, 11^{US}, 14^{US}, 15^{US}). It was described that avoiding risks to culture loss may detract from willingness to relocate. For example, relocation of Alaskan native villages may reduce capacity to teach traditional knowledge due to the involvement of Western government agencies and loss of access to traditional lands where knowledge is based (Participant 14^{US}).

Information to Consider for Successful Relocation

Two participants stated that there needs to be emphasis on rebuilding and maintaining social functions rather than solely physical functions of community during relocation (Participant 2^{US} & 14^{US}). Another participant shared a need to ask who the relocation really benefited, and understand that there is no "one size fits all" relocation approach (Participant 15^{US}).

Built Environment Impacts

Table 3. Built Environment Impacts of Planned Relocation

Built Environment Impacts	**Elements of Participant Discussion**	**Participant Comments**
Impacts of Built Environment Decisions	Relocation could reduce a community's environmental impact, but	*"Ideally, it reduces the footprint of the built environment in the community that*

	decision making can influence these outcomes.	*they're leaving." - Participant* 3^{US}
Inequitable Environments	Built environments of relocation sites may not be comparable to original sites, and inequitable distribution of resources could leave some individuals worse off.	*"I mean, depending on resources, the new places may help equity because if you're able to, particularly in an indigenous population, whenever you're able to give them a little better housing or give them plumbing or electricity or something that they didn't have before, you actually could be raising the disadvantaged if the new place is well-built and had the resources to do it. But that becomes very dependent on the resources there and that resource question is a very major issue." - Participant* 13^{US}

Impacts of Built Environment Decisions

Most participants explained that relocation would ideally reduce the environmental footprint of the built environment in communities that have been relocated. If the relocation requires a new community be built, there is a greater opportunity to influence its design and impact (Participant 3^{US} & 10^{US}). However, it was noted that there was not always follow through with such decisions. For example, one participant described how following Hurricane Sandy, the sites of Staten Island residents' homes who participated in a buy-out program were redeveloped into luxury condominiums instead of being converted to wetlands, as they were told (Participant 15^{US}), [29].

Inequitable Environments

About half of participants described how the built environment of a relocation site may not be comparable to the original community, and inequitable distribution of resources could leave some individuals worse off (Participant 1^{US}, 3^{US}, 7^{JP}, 9^{US}, 11^{US}, 14^{US}, 15^{US}). For example,

larger families that had previously owned or rented a home may have to move to a smaller apartment or trailer home due to the limited resources or financial capabilities after the relocation process (Participant 3^{US} & 10^{US}). Two participants suggested the magnitude of these impacts may be correlated with the scale of relocation (Participant 3^{US} & 11^{US}). Furthermore, one participant described that social stigma may be associated with such reduction in housing quality (Participant 3^{US}).

Furthermore, one participant described that inland relocation sites may contribute to urban sprawl, without adequate transportation resources (Participant 10^{US}). For example, lack of replacement of main roads could preclude access to work or other resources (Participant 6^{JP} & 7^{JP}). On the other hand, relocation of individuals reliant on public transportation from urban to more rural areas could have similar impacts (Participant 3^{US}).

Information to Consider for Successful Relocation

One participant discussed that both practitioners and community members need to consider impacts of relocation to a new site compared to joining an existing community (Participant 3^{US}). Additionally, one participant explained that there needs to be assurances that new sites are not being developed without consideration of future risk (Participant 15^{US}).

Natural Environment Impacts

Table 4. Natural Environment Impacts of Planned Relocation

Natural Environment Impacts	**Elements of Participant Discussion**	**Participant Comments**
Environmental Risk	Relocation sites may have	*"I have, which is we're moving people,*

Trade-offs	new risks that communities are unaware or unprepared for.	*but we're moving them away from one risk and maybe into another."* - *Participant* 15^{US}
Natural Risk Reduction Impacts	Supporting access to a healthy natural environment through the relocation process, and minimizing impacts to the natural environment through the relocation process, can support community health and wellbeing.	*"There is a significant body of research saying having access to the natural environment is very beneficial for mental health. And depending on how it's used, it's also beneficial for physical health. So ensuring access to the natural environment is beneficial for people moving into an area."* - *Participant* 12^{US}

Environmental Risk Trade-Offs

A few participants described challenges with relocation to sites with new environmental hazards, given limited availability of affordable, undeveloped land, creating new safety concerns (Participant 3^{US}, 6^{JP}, 9^{US}, 15^{US}). The need to deeply consider the tradeoffs of introduction of new hazards of potential relocation sites was emphasized, alongside consideration of alternative uses of such sites that may provide greater, more long-term protective benefits (e.g., as wetlands). One participant provided an example about a Japanese village that moved further up away from the coast, destabilizing the mountainside. In addition, a levee at the bottom of the mountainside had been constructed to prevent future storm surges from flooding the village. During periods of heavy rainfall, trees and debris from the mountainside washed downhill and blocked the levee, causing the village to flood. Though these measures were taken to protect the village from natural hazards, they had a counterproductive effect (Participant 6^{JP}). A few participants explained that communities may not be aware of the new environmental risks that come with relocation, and may not be able to mitigate them effectively (Participant 3^{US}, 6^{JP}, 11^{US}, 14^{US}). An example was given where a coastal community was relocated inland due to

flooding risks, but found that they then had to live with drought risk. This drought risk impacted the community's ability to produce enough food for their families, leading them to need additional jobs, exposing them to economic fragility as they were reliant on wages instead of being self-sufficient (Participant 11^{US}). Another participant noted that environmental impact assessments that are typically performed to determine these impacts and guide decision making are often overlooked due to time constraints and other sensitivities, making the environmental impacts unclear (Participant 8^{JP}).

Two participants also discussed the impact of changing locations and natural environments on food security and access to traditional foods. For example, a coastal village in Japan that relocated was described to have had lost access to areas where they had practiced subsistence foraging of mushrooms, impacting their traditional diets (Participant 4^{JP}). Additionally, dietary patterns tied to the physical environment, e.g. fishing or farming, can impact access to preferred foods. On the other hand, relocation could also increase access to food by opening up new environments for hunting and farming. For example, the relocation site of an Alaskan coastal village, whose people had predominantly relied on whaling, afforded new access to hunting grounds, improving food security (Participant 14^{US}).

Natural Risk Reduction Impacts

While most participants conceded that there is no place devoid of climate risks, they noted that promoting access to the natural environment through the relocation process can support community health (Participant 3^{US}, 6^{JP}, 7^{JP}, 9^{US}, 14^{US}, 15^{US}). All participants emphasized the importance of reducing impacts to the natural environment, where possible. Development decisions must consider tradeoffs to the natural environment and the community

itself. For example, decisions may include construction of dykes and seawalls to protect the physical community, which may have deleterious impacts to the natural environment.

Information to Consider for Successful Relocation

Two participants shared that access to future projections of climate and environmental change would help determine when relocation plans need to begin (Participant 4^{JP} & 10^{US}). In addition, two participants stated that use of local knowledge could supplement environmental decision making (Participant 7^{JP} & 14^{US}).

Relationships and Partnerships Through the Planned Relocation Process

Table 5. Relationships and Partnerships Through the Planned Relocation Process

Partnership Characteristics	**Elements of Participant Discussion**	**Participant Comments**
Collaboration and Barriers Between Practitioners and Communities	Relocation plans should be co-produced, but this can be challenging. There is often limited community involvement in planning. Buy-out programs frame relocation as an individual issue, complicating collaboration.	*"So that can be a lot of things in terms of communication, shared goals, co-production of the ideas, but also building trust over time. It can be a challenge." - Participant* 11^{US}
Long-term Relationship Building	Trusting relationships are built through long-term communication and community ties. This is challenging due to time constraints of practitioners and researchers. Collaboration with federal agencies could benefit relationships and relocation outcomes.	*"Maybe the practitioners or the policymakers-- the things they give [can have] some limit on the decision-making to the practitioner and the policymakers, that money and time constraint." - Participant* 4^{JP}

Developing Trusted Research Relationships	Entering partnerships neutrally can improve trust. If practitioners believe they are being judged, they may be less likely to maintain relationships. Facilitating dialogue between other stakeholders and providing resources can improve partnership outcomes.	*"I think part of what you have to build, though, is trust with those individuals. So when I talk to buyout administrators, one of the first things that I try to establish with them is that this is not a gotcha campaign. I'm not out here to tell you what you're doing well or what you're doing poorly."* - *Participant* 1^{US}

Collaboration and Barriers Between Practitioners and Communities

Most participants stated that relocation plans should be co-produced, but this may be complex during relocation where resources may be coming from a single agency. Lack of community input into relocation decisions, including those related to the relocation site (e.g., location, design) and original site (e.g., land use), may exacerbate social and cultural impacts of relocation. In Japan, for example, one participant described that many relocation sites were selected and designed by the government with little input from those that would be living there (Participant 7^{JP}). In order to have community interests represented, community members are needed to participate and guide plan development and implementation (Participant 1^{US} & 3^{US}). Most participants described that the most successful partnerships prioritize community needs and are open to compromise (Participant 1^{US}, 3^{US}, 6^{JP}, 10^{US}, 11^{US}, 14^{US}, 15^{US}). Furthermore, one participant noted that in the United States especially, relocation is considered an individual problem, making it increasingly difficult for practitioners to approach it as a community-level issue (Participant 1^{US}).

Long-term Relationship Building

Nearly all participants emphasized the need for trusted relationships between communities, practitioners and researchers, facilitated by deep, long term communication and community ties. Most participants explained that successful community work takes years, and many practitioners and researchers cannot commit due to time constraints (Participant 6^{JP}, 11^{US}, 12^{US}). Furthermore, one participant described that government turnover impacts the ability to maintain these long term relationships (Participant 15^{US}). Two participants stated that working with partners such as FEMA and HUD, the two main agencies funding U.S. relocations, to collect baseline data and determine where people who have relocated ended up could help determine how they may be doing afterwards (Participant 3^{US} & 9^{US}). However, one of these participants noted that there are privacy concerns expressed by federal agencies about the collection and release of individual and community information to researchers (Participant 3^{US}).

A quarter of participants also noted that historic harms caused by practitioners and researchers should be acknowledged, linkages between environmental hazards and relocation should be clearly explained, and efforts to understand and communicate outcomes of prior relocations should be prioritized (Participant 3^{US}, 9^{US}, 14^{US}). Due to historical harms, it was noted that government agencies may not be the right stakeholder to lead relocation discussions or decisions. Accordingly, a few participants discussed other potential funding sources, not associated with the government, for relocation (Participant 3^{US} & 12^{US}). Furthermore, providing communities with options can benefit long-term partnerships and improve trust. One participant noted that this can make communities feel that they have more agency in decision making and be more likely to openly approach recommendations (Participant 1^{US}).

Developing Trusted Research Relationships

Most participants have stated that when researchers are working with practitioners, they should approach the collaboration in the spirit of learning and providing assistance (Participant 1^{US}, 10^{US}, 11^{US}, 14^{US}). As one participant shared, researchers should start the conversation by sharing, "I am here to help. I want to learn. I want to make the programs better," (Participant 1^{US}). Approaching relationships this way could help build and maintain trust within partnerships. One participant stated that the most important partnerships are between the practitioners themselves, rather than between practitioners and researchers (Participant 3^{US}), and more dialogue among practitioners who have supported relocation processes should be encouraged. While researchers can support relocation by compiling case studies and examining the literature, two participants noted that there remains little funding and little prioritization among academics for multidisciplinary research in this space (Participant 4^{JP} & 12^{US}). Furthermore, a few participants noted that the field of public health has been slow to come to the climate change table, limiting knowledge about climate change on health outcomes generally (Participant 10^{US} & 15^{US}).

Finally, one participant noted that many practitioners in the United States still believe "we can overcome this and stay where we are," (Participant 10^{US}), making it difficult to talk about relocation. They noted that reducing the focus on relocation specifically, and instead discussing the types of future community growth or change and opportunities to do so in health promoting ways may be more productive (Participant 10^{US}).

Future Research Needs

Throughout the interview process, participants identified several information needs across individual, social, built environment and natural environment impacts that could be addressed through future research. This research would ideally be conducted in partnership with relocation practitioners and communities, to improve the outcomes of relocation processes in the future.

Table 6. Future Research Needs

Research & Information Needs	
Individual Impacts	● Determine whether people are better off after relocation (Participant 1^{US} & 11^{US}) ● Identify longitudinal impacts on individuals and how they influence relocation measures (Participant 3^{US} & 15^{US}) ● Assess the impacts of different relocation strategies on wellbeing (Participant 1^{US} & 11^{US}) ● Determine relocation resource needs based on individual vulnerability (Participant 11^{US})
Social Impacts	● Identify commonalities and divergences in social impacts of relocation across communities (Participant 1^{US}, 11^{US}, 14^{US}) ● Determine costs and benefits of relocation to a site that is preferable to the community, knowing they will need to relocate again in the future (Participant 14^{US}) ● Assess acceptable levels of risk among community members (Participant 1^{US} & 3^{US})
Built Environment Impacts	● Identify impacts on health and wellbeing of approaches to selecting and designing relocation sites (Participant 9^{US} & 14^{US}) ● Identify approaches to redevelopment that minimize or mitigate future risk (Participant 9^{US} & 14^{US}) ● Determine infrastructure and housing capacity necessary for receiving communities to accommodate a relocating community (Participant 12^{US}) ● Identify positive and negative impacts of built environment characteristics in new sites or receiving communities

	(Participant 1^{US} & 15^{US})
Natural Environment Impacts	• Determine approaches to involving more professions and communities in environmental decisions making (Participant 1^{US}, 8^{JP}, 14^{US}) • Assess the impacts of introducing green space to vacant land after relocation on gentrification (Participant 1^{US} & 3^{US}) • Evaluate community capacity to mitigate new environmental risks in the future (Participant 3^{US} & 15^{US})

Discussion

While the health and wellbeing impacts of planned relocation remain largely unknown, our findings suggest that they may result from interconnected effects of relocation on the individual, social, built and natural environments. Further, participants in our study pointed to the role of individual agency–or capacity to make or be involved in decisions about relocation outcomes–as influencing the social and environmental impacts of relocation, suggesting its role in determining impact on health and wellbeing. Additional research is needed to determine the resources necessary to equitably improve health and wellbeing outcomes of individuals throughout relocation processes.

Our research highlights that the social connectivity of relocating communities is the backbone of relocation success or failure. Whether it is the need for cohesive, community-wide relocation or the relocation of a community's anchor institutions, the social structure of the community after relocation will be dependent on the successful relocation of these characteristics and institutions. Our findings echo prior research conducted within relocating communities, which emphasized the possibility of damage to community agency and social capital if social characteristics are not considered [12]. As current relocation measures throughout the United States and Japan emphasize residential relocation rather than the relocation of community

institutions [9], social capital, spirituality and accessibility may be at risk during and after relocation. Additional research is necessary to determine how best to relocate or replace community infrastructure and institutions to protect wellbeing.

Our results suggest that the type of relocation and the resources available throughout the process impact if and how communities' health and wellbeing is impacted. The relocation events that have been researched in the past have primarily been from events where communities were relocated into new fully- or partially-constructed sites. Consequently, the impacts of relocation on communities that relocate into receiving communities and other existing sites have been overlooked. This gap upholds the concern from communities and researchers over the ability to acquire adequate housing and maintain environmental quality after relocation [13], as well as the probability of impacts to social determinants of health after relocation [14]. Both relocation types, the development of a new site or the joining of an existing one, can result in inequitable living conditions and built environments, but we need further research to identify how these differences impact health and wellbeing as well as what resources are needed to improve these outcomes.

Participants in our study highlighted concerns about environmental safety trade-offs during the relocation process, and the influence both communities and government agencies have over these decisions. Communities may prefer certain sites due to their natural environment or other characteristics (e.g. proximity to culturally important places or resources) that may not be the safest choice for relocation due to environmental risk, potentially resulting in additional future needs to relocate. On the other hand, government agencies' focus on safety may cause them to overlook the social and cultural needs of communities during the relocation process. For example, government prioritization of physical safety, such as the building of the "Great Wall of

Japan" after the Great East Japan Earthquake [9], which diminished community access to coastal regions, impacting residents' ability to reach fishing grounds and cultural infrastructure [12]. Additional research is necessary to identify relocation solutions that balance physical safety with the wellbeing protection afforded by retaining social, cultural and natural resource access and community agency.

Throughout the data collection process, interviews brought to light important resources and examples of relocation. Case studies provided by participants from relocation processes in New Orleans, Staten Island, Alaska and the eastern coast of Japan provided nuance to their comments, including the context in which built environment redevelopment occurs outside of relocation measures [29], as well as the social implications of government-funded relocation processes [30]. Additionally, there are opportunities to learn from climate migration experiences to better understand potential approaches and impacts of comprehensive relocation planning. Climate migration is associated with human mobility, with little attention paid to the relocation of physical and social infrastructure [31], a critical consideration of successful relocation processes which has been demonstrated through the interviews.

Finally, our findings highlight the need for partnerships between practitioners, researchers and community members during relocation processes that prioritize equity, teamwork and follow through. However, relocation timelines and resource constraints were reported to preclude the development of such relationships. Participants suggested that sustainable sources of funding be identified at the front end of partnership development, that researchers provide access to educational resources and technical assistance to communities throughout the relocation process and that continuous dialogue between researchers, practitioners and community members be encouraged throughout the relocation process.

Limitations

Findings of this research may be limited due to the small sample size of knowledgeable participants available for the topic of planned relocation. The results are from the perspective of participants from two countries, the United States and Japan, and are not necessarily generalizable to other contexts. As interviews were conducted with participants affiliated with academic institutions, our findings do not represent the perspective of those with boots-on-the-ground experience planning or implementing relocation: Additional research should engage their perspectives. Moreover, interview participants' knowledge may be limited to the communities that have been the focus of their own research, and their perspectives are grounded in their disciplinary expertise and lived experience. Finally, the majority of our participants were not experts in public health, as limited health research has been performed related to the impacts of relocation. Accordingly, engaging public health practitioners with lived experience in planned relocation is necessary to inform future research and partnership development.

Conclusion

The effects of climate change and other coastal hazards are posing existential threats to coastal communities, resulting in a push for community-level changes. Some of these communities are considering "planned relocation," "managed retreat," or "uphill expansion." Despite having fewer costs and more mitigation benefits compared to engineering measures, planned relocation is controversial due to its potential for cascading socioeconomic, health and wellbeing impacts. Through key informant interviews with 15 planned relocation scholars, we identified potential pathways by which relocation decisions and processes may impact health and wellbeing of affected individuals, as well as relevant research and information needs for future

relocation planning. Our findings indicate that planned relocation has interconnected impacts on the individual, social, built and natural environments. Individual agency in the relocation process, the capacity to make or be involved in decisions about relocation outcomes, is mediated by individual and social characteristics and is central to the impacts of relocation on environmental conditions. Social connectivity and anchor institutions are necessary for a positive community relocation experience, allowing for social characteristics and resources to be maintained. Finally, multidisciplinary relocation approaches, which prioritize input from practitioners, researchers and community members, positively affect relocation outcomes, allowing for physical safety, community needs and environmental protection to be considered in relocation planning and implementation.

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Overall Conclusion

The increasing threats of climate change and coastal risks throughout the world have required communities and governments to consider more drastic mitigation measures. While buyouts are currently the primary method of relocation in the U.S., they pose significant social, economic and equity concerns. The use of planned relocation is limited due to concern over potential cascading health and wellbeing impacts, despite the need for more long-term mitigation actions. Communities that have undergone planned relocation have experienced both positive and negative effects to their health and wellbeing, with these impacts depending on both socio-economic factors as well as availability of both internal and external resources and support.

Future research should explore the long-term impacts of planned relocation on individuals and communities in the context of physical, social and environmental wellbeing, as well as evaluate the impacts of external support and how to utilize them equitably and minimize future risks.

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Appendix A. Interview Guide

Learning About the Health, Well-being, and Environmental Justice Impacts of Coastal Planned Relocation in the U.S. and Japan
Managed Retreat Scholars and Professionals Interview Guide

Researcher's Statement:
I am asking you if you will participate in a research study. I will now provide information you will need to help you decide to participate in the study or not. You may ask questions about the purpose of the research, the possible risks and benefits, your rights as a voluntary participant, and anything else that is unclear. Once I have answered your questions, you may decide whether you would like to participate or not. This process is called informed consent.

Purpose of the Study:
I am conducting this study to learn about the knowledge and information gaps related to the health and wellbeing impacts of planned relocation, also known as managed retreat, in order to determine what future research around this topic should explore.

Study Procedures:
I will be asking you a series of questions about your knowledge, experience and perceptions of the factors that influence health and wellbeing in communities that are planning or implementing community relocation, as well as gaps in available information or existing research on these topics. Specifically, I will ask about your knowledge or perceptions about how the managed retreat process impacts - or could impact - individuals, social environments, built environments, and natural environments, as well as potential cascading implications for their health. I am also interested in hearing about how researchers and practitioners can work together to address information needs about health and wellbeing impacts of managed retreat. Each interview will last 30 minutes to 1 hour. I will not ask for any sensitive or personal information during the interview. The questions will focus solely on your knowledge of existing material and what you have observed in your research/work.

In a few weeks, I will provide you with a summary of the key takeaways from your interview. I will ask that you review this and provide me with any feedback or corrections within one week, or to let me know if you need more time.

Benefits to the Study:
The results of this study may inform future research on the health impacts of managed retreat.

Confidentiality of Research Information:
I would like to audio record to ensure that your responses are accurately summarized in the final products. These recordings will be sent to a professional transcription service and be transcribed

for analysis. Study outputs, including reports, papers, or presentations will not include your name or affiliation without your explicit consent. Interview data that has been de-identified may be placed in a data archive for future research use. Your name or affiliation will not be associated with this data without your explicit consent. Despite these steps to protect your privacy and confidentiality, it may be possible to identify you based on your responses or details you may share. You may refuse to answer any questions throughout the interview.

Questions:

Do you have any questions?
Do you consent to participate in this interview?
Do you consent to having this interview recorded?

1. Can you describe your experience, expertise or professional role as it relates to planned relocation/managed retreat?

2. Can you describe how you've observed or how you perceive coastal relocation/managed retreat to influence the health and wellbeing of individual community members or households?
   - Follow Up: How do you expect individual characteristics, such as age, race, gender, or education influence how these impacts are experienced?
   - Follow Up: What additional information about the individual determinants of health impacts are necessary to inform planned relocation/managed retreat decision making?
   - Follow Up: Can you share any experiences or stories of how planned relocation/managed retreat has affected individual community members or households, including their health and wellbeing?

3. Based on your experience and observations, how does planned relocation/managed retreat affect the social environment of the relocating community?
   Prompt: For example impacts to economic stability, social equity, social capital and cultural identity
   - Follow Up: How do you think these impacts on the social environment influence health or wellbeing?
   - Follow Up: What additional information about the impacts of the social environment and their influence on health and wellbeing is necessary to inform planned relocation/managed retreat decision making?

4. Based on your experience or observations, how does planned relocation/managed retreat affect the built environment of the relocating community?

Prompt: For example impacts to community and infrastructure design, accessibility, and land use choices

- Follow Up: How do you think these impacts on the built environment result in impacts on health and wellbeing?
- Follow Up: What additional information about the impacts to the built environment and their influence on health and wellbeing is necessary to inform planned relocation/managed retreat decision making?

5. Based on your experience or observations, how does planned relocation/managed retreat affect the natural environment and its impacts on the relocating community?
   Prompt: For example impacts such as environmental quality, food security, and potential environmental hazards
   - Follow Up: How do you think these impacts to the natural environment result in impacts to health and wellbeing?
   - Follow Up: What additional information about the impacts to the natural environment and their influence on health and wellbeing is necessary to inform planned relocation/managed retreat decision making?

6. Beyond what we've already discussed, are there any other information decision makers need access to in order to mitigate the health and wellbeing impacts of planned relocation/managed retreat?

7. How can researchers partner with practitioners to conduct research to address the information gaps related to health and wellbeing impacts of planned relocation/managed retreat?
   - Follow Up: What barriers do researchers face when partnering with practitioners?
   - Follow Up: What barriers do practitioners face when partnering with researchers?
   - Follow Up: What support is needed to enable these partnerships?

8. Are there others with relevant expertise or lived experience that you recommend we reach out to for interviews?

Closing Remarks

That's the last of our questions, do you have any questions for me? [pause to ask or answer any additional questions]. I really appreciate you taking the time to speak with me and to share your observations and thoughts. If you have any additional questions or thoughts that you'd like to add, feel free to email or call me at the number in my email signature.
Have a great rest of your day!

Appendix B. Codebook

Main Code	Sub Code	Definition	Example
Individual Impacts		Discusses impact(s) of relocation to individuals or their families.	“I think that the biggest issues are maintaining kind of the essentials of health and well-being. That’s everything from the job or work being done.”
	Influences of Age	Discusses how age influences the experience or impacts of relocation.	Elderly residents may have a harder time creating new social ties after relocation.
	Other Individual Characteristics	Discusses how individual characteristics (other than age) influence the experience or impacts of relocation.	Men have a more difficult time creating new social ties after relocation, and are more likely to struggle with isolation.
Social Capital Impacts		Discusses social impacts of relocation to a community (i.e., beyond the individual), such as social capital (the connections between individuals in a community that allow for the obtaining/sharing of resources, whether physical, cultural, spiritual, etc) and ties to others in the community OR discusses how the community experiences a change/or no change to social capital during their relocation process. Also, may discuss concerns that the community may have about their social capital for their future phases of the relocation process.	"You're moving everything they know. And so I would think it's more whether the group can move as a group that can maintain some of those social ties and could work well."
	Impacts on Place Attachment	Discusses if and how a community experiences changes to place attachment (the emotional bond between a person/group and their original location) during their relocation process. May also discusses community concerns regarding place attachment during or after the relocation process.	"So they decided to move to the other places, the memories of their original places and some religious facilities such as Shrine and Temples simultaneously lost in the process of the location. So yeah, those using memory type of thing is also the very negative, I think."
	Impacts on Cultural Identity	Discusses how the community experiences a change/or no change to cultural identity during their relocation process. Also, any concerns that the community may have about their cultural identity for their future phases of the	"And so it's just been really challenging to figure out how to live there and relocate there when it's clearly known that the permafrost is melting. So culturally, it's an adequate choice because it's still on the coast. And then there's traditional history of cultural use

		relocation process.	there and stories dating back that say that place never floods."
Built Environment Design Impacts		Discusses the impacts of being in the same or different built environment (the infrastructure and community services that are available) after a relocation process, and/or how the design of the community/place that persons have been relocated to may be different (positive/negative), as well as associated impacts to their health and/or wellbeing.	“You either could end up with a built environment if the resources are there that is better than the one you came from if you're able to upgrade the energy efficiency of the buildings or put in more better electricity, water sewage, plumbing, whatever, depending on what the community is and what they had before. So it really could go any of the ways.”
	Impacts on Accessibility	Discusses how the act of relocation impacts accessibility to necessary or desired resources.	Relocating a community may make residents have to travel further to get what they need.
Natural Environment Impacts		Discusses the impacts of the natural environment on the communities that have relocated. Describes how people’s lives may be changed because the natural environment has changed.	"But I think it just requires manipulation of the natural environment in ways to support people safe livelihoods. "
	Impacts on the Old and New Environment	Discusses how relocation impacts the natural environments that have been abandoned and the environments that have been developed or migrated to.	Abandoned locations after relocation could potentially be returned to a natural state and used as mitigation measures for future climate related events.New environments could feel more impact from an influx of population.
Partnerships		Discusses any collaborations (or opportunities to collaboration)during relocation planning or implementation among different groups representing interest.	"I think any research should have that community involvement."
	Barriers to Partnerships	Discusses any barriers or difficulties that community members, researchers, or government/policymakers may encounter during their partnerships throughout the preparation or process of relocation.	Academics may be exploitive of communities undergoing relocation, impacting the ability for researchers and practitioners to work together to help come up with strategies.
	Support Needed for Partnerships	Discusses necessary or desirable skills/resources (e.g., funding and expertise) or social support to facilitate partnerships between different groups in the relocation planning and implementation process.	Long term funding is needed to maintain successful planning and opportunities need to be organized for regular interactions between researchers and practitioners to happen.

Information Needs		Discusses gaps in information that could be used to understand or address the health and/or wellbeing impacts of relocation.	"We need baseline data."
	Individual Information Needs	Discusses gaps in information that could be used to understand or address the individual determinants of health and/or wellbeing impacts of relocation.	" My sense is it is not easy to reach a consensus in any community on what to do that there will be opinions on where to go."
	Social Environment Information Needs	Discusses gaps in information that could be used to understand or address the social determinants of health and/or wellbeing impacts of relocation.	"I don't know how many before and after studies have been done which would basically research of a certain amount of surveying before and answer. And that has that whole cultural issue of whether you're interviewers can be from the same culture versus White man outside are going into places of different races and ethnicities. "
	Built Environment Information Needs	Discusses gaps in information that could be used to understand or address the built environmental determinants of the health and/or wellbeing impacts of relocation.	"I think that, again, some of the before and after surveys would be useful. What do they have? What worked in giving them a new place? And probably when is good enough rather than great so that you're not going to build everyone in the new place, the fancy version of what it could be, but can you make it at least as good or an improvement on what they had, but still keep the talk cost down?"
	Natural Environment Information Needs	Discusses gaps in information that could be used to understand or address the natural environmental determinants of the health and/or wellbeing impacts of relocation.	"It may help to do some modeling of how that natural environment is changing. So that I would think there would be people who would know how to look at an island that's washing away or looking at how the land is changing and be able to give some predictions of what it would do for better or worse in terms of how that land ends up. "
Great Quote		Discusses a story or example of how relocation has, or could, impact the health and wellbeing of individuals, communities, or other persons involved in the relocation process. Text coded as “great quote” should be co-coded with the respective impact it describes.	

Appendix C. Recruitment Email for Scholars

Email subject: Request for a research interview on health impacts of planned relocation/managed retreat

Dear [put their name here, in the format Dr. [last name]],

I hope this email finds you healthy and well! I am a researcher at the University of Washington (UW) Department of Environmental and Occupational Health Sciences. I am working with a team of researchers at UW and Tohoku University seeking to identify practice-relevant information gaps and related ways in which managed retreat influences health and wellbeing. Given **your experience or expertise related to managed retreat, I am writing to see if you would be available for a 30-60 minute interview in the next few weeks?**

Specifically, we are seeking to interview professionals knowledgeable about how the managed retreat process impacts - or could impact - individuals, and their social, built, and natural environments, as well as potential direct and cascading implications for health and well-being. We are also interested in hearing about how researchers and practitioners can work together to address information needs regarding the health and wellbeing impacts of managed retreat.

The goal of this work is to identify high priority information gaps related to the health and wellbeing impacts of managed retreat to inform a managed retreat and health research agenda. We will share this information broadly, including through presentations, a report, and a paper of publishable quality.

If you are available and interested, please let me know, and I will follow up to find a time that works best for you. I am also happy to answer any questions you may have before committing to an interview.

Thank you for your time, and I look forward to hearing from you soon!

Best,

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