Migration as Adaptation

Flood-induced tipping points and cascading events of relocation in coastal rural and urban areas

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Households and communities challenged by coastal flooding will likely consider relocation as an adaptation strategy only after reaching a certain tipping point beyond which they will be unable to cope with impacts. Such tipping points or thresholds may be reached in response to a single major disaster or a combination of minor hazard events and persistent nuisance flooding, where indirect cascading events undermine livability and lead to relocation. Tipping points and cascading events have been extensively explored in the literature but rarely in the context of coastal flooding and relocation. Currently, there is a growing need to understand and anticipate how coastal relocation trends may unfold with accelerated flooding to support the advancement of policy and planning mechanisms to assist with this process. The main objective of this paper is to identify tipping points and cascading events that could exceed the coping capacity of households and municipalities to deal with flooding and lead to permanent relocation in the Mid-Atlantic rural and urban areas. Namely, the paper outlines the direct and indirect flooding impacts that could trigger relocation, relationships and dependencies between them, as well as the key contextual factors, uncertainties, and possible interventions that may shift the tipping points of coastal relocation and influence relocation outcomes. The qualitative data were obtained via interviews with 30 decision-makers from the rural and urban coastal communities prone to flooding in Maryland, Virginia, and North Carolina. Interviews were conducted remotely during summer 2020 to accommodate for COVID-19 circumstances. Interviews were recorded, transcribed, and analyzed using Atlas.ti qualitative data analysis software. Our results show that tipping points and cascading events differ between rural and urban communities in part due to their qualitative determinants such as place attachment, connection to the land, land-water-based livelihoods, and cultural values. Unique characteristics of rural and urban populations mostly define where their tipping points are and which cascading events may be the primary drivers of their decision to move, but are consistently the same when it comes to driving forces of relocation. In rural areas, impacts on livelihoods and the economic base represent more important considerations, while in urban areas, disruptions due to interrupted daily routines, services, and accessibility seem to be of a greater concern. Our results show that there is still a strong commitment to stay in place versus planning for a more extensive retreat although there is a growing understanding that relocation may happen down the road, but in a more incremental and organic manner reflecting household- and neighborhood-level tipping points.

Planning with dignity: cultural encounter and community-led planning with Indigenous communities

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In 2009, the United Nations Framework Convention on Climate Change (UNFCCC) labelled human migration due to climate change an area of climate action. While academic questions around climate migration are many, there is consensus that with warming temperatures millions will move in the next three decades, primarily within domestic borders. Global climate migration best practices focus on building capacity for potential sending and receiving communities to cope with future slow- and

rapid-onset mobility patterns and stress the importance of consultation and community involvement in disaster migration and relocation decision-making. What is less clear, however, is how to create community plans given the highly particularized and uncertain nature of projected migration patterns and the difficulties inherent in integrating perspectives across climate science, disaster response, migration scholarship, and local and traditional knowledge systems. To address this gap, I propose to use postcolonial Science and Technology Studies scholar Fa-Ti Fan's concept of cultural borderlands as a framework for analyzing knowledge negotiations and exchange at the 'cultural encounter' of climate migration consultative processes. Cultural borderlands as a model emphasizes diffuse networking and transcending disciplinary silos in scientific knowledge development rather than hub-spoke interactions. It sees knowledge exchange as a cultural practice and recognizes the role of interlocutors and translators as mediators in the exchange. By examining existing case studies of climate change planning with Indigenous communities, I look at how the framework might usefully inform community-led processes harnessing scientific, traditional, and lived expertise in climate migration planning.

Adaptive Migration: Bridging Planning, Policy and Practice for Climate Justice

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As residents of coastal communities in Louisiana and elsewhere adapt to increased flooding and storm intensity due to sea level rise, coastal erosion and subsidence, migration has become an increasingly important adaptation option. Yet research shows how existing adaptation policies do not adequately respond to lived conditions of residents and communities on the frontline of environmental change and can perpetuate inequality (Nelson, Ehrenfeucht, Birch & Brand, 2020). Adaptive migration in coastal Louisiana reveals the complexity of climate change in coastal settlements and how questions of justice intersect with poverty, property valuation, historical and cultural ties, and community change. This research examines the policy and programmatic transitions needed to respond to these challenges and provide more just adaptation outcomes in Terrebonne Parish, Louisiana. In recent decades Terrebonne Parish has experienced severe coastal land loss, and is projected to lose more than half of the remaining marshes, which historically have served as a buffer for coastal communities, in the next fifty years. Between May 2018 and November 2019, we interviewed 29 professionals working in the region. Interviewees held positions ranging from state and local planners and policy makers to nonprofit and business leaders and university researchers on the forefront of anticipating and responding to environmental and community change. Fifteen of the professionals lived or had lived in Terrebonne's coastal communities and spoke both about their perspectives as professionals and residents.

The interviews focused on three main themes: 1) the future of Terrebonne Parish's coastal communities; 2) current adaptation strategies to address coastal vulnerability as well as priority planning and policy interventions, and 3) how the various and at times conflicting planning goals and objectives shape future adaptation action. The professional participants identified three challenges that impeded just adaptation action. First, environmental change and adaptation responses crossed jurisdictional lines, but much of the agency structures were confined to political boundaries. More interjurisdictional action was needed to guide safe residential relocations, minimize tax revenue losses, and support infrastructure investments and environmental restoration. Second, the compounding effects of economic, social and community change in a broader context of land loss and climate change have reproduced disadvantage for residents of frontline communities. Without attention to the multiple ways disadvantage is reproduced, it will continue to happen. In addition, conflicting policy goals could lead to the ongoing need to repair infrastructure to serve recreational property owners, even as long-time residents are forced to move,

shifting resources from one group to another. Third, policy must allow for a continuum of resident initiated responses from adapting in place to relocation (Bronen 2013; Bronen & Chapin 2013). In making adaptation decisions, residents are responding to multiple cascading factors and events over time, not just climate induced changes (Nelson, Ehrenfeucht, Birch, Brand & Williams. 2020; Nelson, Ehrenfeucht, Birch & Brand, 2020). Policy and programs, even if implemented through disaster response, must allow for long term transformational patterns of development and restoration. Despite the impediments to just adaptation, innovative thinking and action was possible. Professional participants prioritized longer-term planning horizons in order to address existing disconnects and future tipping points, the need for relocation and assistance policies to meet the needs of frontline residents, and new geographies of action such as watershed planning that can help guide Terrebonne Parish's difficult decisions about public investment, development regulations and priority setting.

Resilience for Whom: A Climate Mobility Framework for Equitable Sea Level Rise Adaptation

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Sea level rise (SLR) is increasing extreme sea level events, including high-tide and storm-associated floods, which will drive migration and displacement of populations within coastal communities. Recent studies have focused on the macro-economic implications of climate-driven migration and displacement, but there remains a large research gap in our understanding of the multiplicities of climate related movement, or climate mobilities within a given locality. Mobility considerations encompass the social and economic disparities within coastal communities that may impede the ability of residents to cope with climate migration outcomes. There is a pressing need to understand local dynamics of climate migration as experienced across the spectrum of vulnerability to highlight equity considerations in sea level rise adaptation planning.

We present a novel climate mobility (CM) framework that addresses the multiplicities of potential future climate migration outcomes to inform resilience and adaptation decision making. The proposed work builds on the most current understanding of climate related mobility that considers the intersection of the spectrum of exposure risk and social/economic vulnerability as producing four discrete mobility outcomes for populations across coastal communities: *(1) stable, (2) migrating, (3) displaced, and (4) trapped*. We test the CM framework in Miami-Dade County (MDC), Florida, USA, a metropolitan region with substantial income and racial inequality and exposure to sea level rise.

We develop social vulnerability profiles that measure the geospatial convergence of specific indicators that reduce or contribute to social vulnerability. We employ an expectation maximization algorithm through model-based clustering to identify areas of similar socio-economic characteristics and use the profiles of each cluster to determine relative vulnerability. We intersect these vulnerability profiles with three measures of flood hazard from SLR with increasing modeling complexity: (1) equilibrium flood mapping using the MDC 2018 5ft grid Digital Elevation Model (2) FEMA Flood Insurance Risk Maps, and (3) compound flood hazard indicators from the Parallel Raster Inundation Model (PRIMo). We then use the climate mobility framework to evaluate future adaptation planning considerations across scenarios of population growth, affordable housing, and managed retreat. Preliminary results indicate more than half of the Black population (17% of total population) is categorized into either a Displaced (35.6%) or Trapped (26%) typology through 2100, while the Non Latinx White population (13% of the total population) represent almost half of residents in Stable (21.2%) or Migrating (22.9%) typologies though

2100. The CM framework can help evaluate the equity implications of local climate adaptation policy and therefore carries global relevance for addressing the governance challenges of adaptation.

The Dutch Plan B: Keeping Retreat on the Table in "the Safest Delta on Earth"

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The Dutch are known worldwide for high-end water defense systems, thanks in large part to an aggressive national marketing strategy. The emphasis at home and abroad has been on resilience in place, with efforts keyed to best case SLR scenarios of 0.85 or 1.0 meters by 2100. Since 2017, a loosely coordinated group consisting of climate scientists at Deltares, the premiere water research institute in Delft; a handful of landscape designers; and some sympathetic journalists have tried to inform the public about accelerated sea level rise and to influence policy makers to begin adaptive planning for accelerated sea level rise of 2.0 meters or more. On television, in newspapers, and in town hall meetings, the public encountered and debated a set of four adaptation pathways: three versions of protection, one of which integrates advance, and a hybrid of accommodation and retreat known as Meebewegen (going with the flow). For the first time, the Netherlands started to contemplate the possibility that the future might entail retreat. In response to these interventions, the ministry of water and infrastructure established a research program focused on sea level rise and adaptation pathways in 2019. The Netherlands seemed to be on the verge of a paradigm shift from the age-old battle against the water to a national strategy more in tune with regionally successful nature-based solutions such as Room for the River.

At the conclusion of the first phase of public engagement, the choice resolved into two diametrically opposed strategies: advance or accommodate plus retreat. The former entails building a massive sea wall in the North Sea along the entire coast, essentially a Great Garuda (the controversial Dutch-Indonesian plan to protect Jakarta) for the Netherlands: massive sandmining operations, devastating environmental impact, huge fossil fuel expenditure and corresponding emissions, and the deployment of enormous pumps to drain the Rhine, the Maas, and the Scheldt into the North Sea. The latter means slowly moving up to 8 million people from the densely populated West to the East and incrementally returning up to 26% of the country to the sea. Climate scientists had hoped that the detailed depiction of the financial and environmental costs of protection-based scenarios would shock the public and policy makers into realizing that compounding vulnerability by building more extreme defenses would be irrational. Instead, deep cultural instincts kicked in and opinion shifted visibly in favor of advance. Under the banner of a new battle against water, accommodate and retreat were impugned as dystopic and apocalyptic, all but foreclosing on further discussion. More importantly, the new national land use plan calls for construction of 1 million housing units without taking sea level into account, thus exacerbating what one climate scientist called the ongoing "trek" to the coast. The government suggests that decisions about alternative adaptation paths can be delayed. While that is theoretically true, in practice every public and private investment in construction and infrastructure at a altitudes lower than 2 meters above sea level amounts to a wager that the Netherlands will opt for advance and reject retreat. The Dutch water defense system is premised on avoiding the kind of catastrophic event that could produce system change. By deferring catastrophe in this way, necessary shifts in thinking are also continually deferred. Are there ways in which the deferred catastrophe can nonetheless be allowed to seep into the built environment and into people's minds by degrees? Specifically, how can concerned scientists and designers keep accommodation and retreat on the table as an option?

I will report on the outlines of a research and design project that is currently coming together. As PI, I'm consulting with Marjolijn Haasnoot, the Deltares climate scientist and adaptation specialist who set the Dutch conversation in motion; Eric-Jan Pleijsters, founding director of Lola Landscape, whose vision of NL2200 became emblematic of the pathway involving accommodation and retreat; Gerwin Hop, founding director of Overmorgen, a sustainability consultancy owned by Arcadis; and Co Verdas, chair of the Rivierenland water district, which borders on Germany. The goal is to create a model of and a roadmap/timeline for a Dutch-German transboundary region that involves sustained collaboration on infrastructure, housing, job creation, industry, education and research, entertainment and culture, the circular economy, and climate resilience, with a focus on fostering welcome culture and developing the capacity to absorb large population influxes over time in the context of an overarching strategy of migration as climate adaptation. (Pleijsters is also intrigued by the opportunities presented by the scaled-up logistics of mass relocation of people and assets.) Because the retreat scenario inevitably brings the Dutch-German border into play (and the Belgian border to a lesser extent), we've decided to make this a centerpiece of our project. New models of cross-border collaboration will be essential for climate migrants in countries without sufficient land and/or resources to accommodate them. Modelling retreat might be a new opportunity for the Netherlands to burnish its adaptation credentials, even if at next week's Climate Adaptation Summit in Groningen (25-26 January) the word retreat passes no one's lips.

Charting Justice for Refugee Relocation Under Extreme Climate Change

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As of this writing, there are 26 million refugees under UN mandate in 134 countries who have fled war and political persecution, with 10% living in UNHCR-managed refugee camps. The average stay in a refugee camp is more than ten years, and more than two-thirds of refugees live in a "protracted refugee scenario," defined by the UNHCR as a situation in which "basic rights and essential economic, social, and psychological needs remain unfulfilled after years in exile." Such conditions exacerbate the potential for social exclusion, economic isolation, and climate vulnerability across generations. Indeed, refugees need special assistance to adapt to climate change impacts, but they are consistently excluded from national disaster risk reduction and climate change adaptation planning, and most of the world's major refugee-hosting countries fail to mention refugees in progress reporting around Sustainable Development Goal 13: Climate Action. Further, the encampment of refugees and asylum seekers restricts their ability to migrate within host countries and limits their agency to implement certain adaptation strategies including planned individual or household relocation. With the unrelenting advance of climatic change, there is rising concern about the viability of long-term human habitation in many of the world's refugee camps as rising surface temperatures push human physiology beyond safe functional limits. For refugee populations in camps that face extreme climate change effects, there are three potential options: the development of extensive on-site mitigation and adaptation measures, migration to a third country or the origin country, or relocation within the host country. This presentation contributes to nascent discussions of planned collective relocation and climate adaptation strategies for refugees by providing a framework to consider dimensions of social justice (including distributive, procedural, and restorative justice) in crafting a climate-induced relocation approach that promotes the agency, dignity, and security of refugees and host communities alike.