At What Point Managed Retreat?: Habitability and Mobility in an Era of Climate Change

Event Schedule

Tue, Jun 20, 2023

2:00 PM

1A) Climate Induced Human Migration: Engagement and Professional Development for Practitioners and Communities (panel)

② 2:00 PM - 3:30 PM, Jun 20

Climate change brings a plethora of challenges and opportunities to communities. In this session, we will explore how to match educational resources with practitioners and communities facing the need to relocate due to climate change impacts. We will discuss the same for communities preparing to receive new populations due, at least partially, to climate change, recognizing that other push and pull factors impact the decision to move. Panelists will include community leaders, Sea Grant, Climigration Network, and the American Society of Adaptation Professionals (ASAP). Panelists will share approaches, processes, experiences, and thoughts on shifting ownership of - and power over - relocation decisions to community residents and how to discuss climate risks and adaptation options with community residents to support effective decision-making. Sea Grant will present different programs used to assist communities discuss climate-induced challenges to their ability to safely remain in their homes, such as scenario planning, train-the-trainer, community science as well as others. This will include findings from the Research Coordination Network, People on the Move in a Changing Climate program. Insights from a recently funded Climigration project involving practitioners and community leaders will be shared. ASAP will share information on their training programs for practitioners which highlight the latest tools, methods, and resources to assist communities facing climate-induced human migration. Following presentations we will engage the audience in a dialog about additional needs for trainings, engagement approaches, and tools for addressing climate impacts on communities.

📢 Speakers



Katherine Bunting-Howarth Cornell University - NY Sea Grant



Mona Behl Associate Director Georgia Sea Grant

Debra Butler

Executive Director American Society of Adaptation Professionals



Kristin Marcell

Director Climigration Network

1B) Envisioning a permanent, proactive managed retreat program in New York State. (World Cafe)

2:00 PM - 3:30 PM, Jun 20

Earlier this year, New York State (NYS) voters approved the Environmental Bond Act, a historic \$4.2B allocation to prepare for the worsening impacts of climate change. The bond includes a dedicated \$250M for a voluntary flood buyout program. Against this backdrop, we are proposing a session that will leverage the knowledge of NY/NJ resilience practitioners, government officials, community leaders, and academics to envision a proactively administered, permanent managed retreat program that coordinates the full services of a state government to transform coastal communities.

As part of this session, we will envision how managed retreat can move from a siloed and reactive program to an overarching public program that moves beyond purchasing homes and considers broader societal goals (e.g., workforce development, designing receiving cities, and increasing the affordable housing stock). Our ultimate goal is to produce recommendations for the design of a managed retreat program that is permanently integrated within the NYS government and that comprehensively considers the process from property acquisition through disposition and support for receiving communities. We will produce a policy brief with recommendations and considerations for designing such a program and deliver it to the Deputy Director of Policy in the New York State Governor's Office. The main question we will consider is, how can we best coordinate resources across NYS agencies to design a comprehensive, proactive, and permanent managed retreat program?

To address the overarching goals of this session, we propose the following discussion questions within five broad topic areas:

Program Design and Coordination: What services should be provided as part of a permanent managed retreat program? Which agencies within NYS should be considered in the design of a permanent managed retreat program? What are existing mechanisms that can facilitate coordination among these state agencies? Should new mechanisms be considered? How would a community-based managed retreat program differ from a single-home retreat program?

Risk Mapping: What risk mapping capabilities exist within the state or broader academic communities? What criteria should be considered for identifying eligible communities for relocation? What criteria should be considered to identify potential receiving communities?

Stakeholder Identification: Which stakeholders need to be considered to administer a successful program (e.g. municipal governments, non-profit and community organizations, land banks etc.)? How can the state support community-driven buyouts/ organizing? How can the state provide information to communities within these discussions (e.g. legal issues, ownership, titles. etc.)?

Post-Relocation: What should happen to the land afterwards/ who has ownership? What purposes can the land serve (e.g. parks, ecosystem restoration, etc.)? Which agencies would need to maintain the land? How will contaminants be removed?

Environmental/climate justice: How can managed retreat programs best serve disadvantaged communities? How should disruption to the social fabric of communities be considered? Can receiving communities become an opportunity to foster economic and social resilience (e.g. workforce development, housing counseling, etc.)?

Speakers

Nadia Seeteram Postdoctoral Research Scientist Columbia University



Linda Shi

Assistant Professor Cornell University



David Burgy

Director of Strategy and Development New York State Office of Resilient Homes and Communities



Kelly Leilani Main

Executive Director Buy-In



Anjali Fisher Project Program Manager King County Washington



Jane Brogan Disaster Recovery Program Director APTIM



Courtney Wald-Wittkop Manager, Blue Acres Program

NJDEP

1C) Adaptive Mind for Coastal Professionals- A Training in the Psychosocial Skills for Managed Retreat (training)

2:00 PM - 3:30 PM, Jun 20

Please note this training will be in-person only. The confluence of accelerating climate change and sea-level rise, more frequent and severe coastal disasters, widespread systemic injustice and oppression, and any number of additional environmental, social, economic and public health challenges (such as the COVID 19 pandemic) is creating an unprecedented set of challenges for coastal professionals. Our research to date suggests that along with vulnerable individuals and communities, those working to address these crises - including through the difficult adaptation strategy of managed retreat - are at high risk of burn-out. The climate resilience workforce must perform its essential work in the context of repeated trauma and constant change, high complexity and pervasive uncertainty. They feel inadequately trained to facilitate, navigate and in fact lead communities through the transformative and all-too-often traumatic changes awaiting them. These conditions have pushed many professionals to the brink of despair and exhaustion as they struggle to confront their own and collective grief as well as a host of other emotional responses even as they remain committed to advancing their critical work. The Adaptive Mind project focuses on supporting the people who do this work by understanding, fostering and strengthening the psychosocial skills and capacities of those who work in these challenging settings of intersectional crises. Presenters will share an overview of the project, discuss results from initial research to characterize the challenges and experiences of climate change professionals, and - drawing on pilot trainings completed to date - give attendees a taste of the Adaptive Mind training.

₩ Speakers

Susanne Moser

Director, Climate Change Science & Policy Hub Susanne Moser Research & Consulting

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Kristen Goodrich

Coastal Training Program Coordinator Tijuana River National Estuarine Research Reserve

Elizabeth Rohring

Retired National Sea Grant Office



Kristin Baja

Director of Direct Support & Innovation Urban Sustainability Directors Network

4:00 PM

2A) Building a Better Buyout: Recommendations from Practitioners and Participants (panel)

④ 4:00 PM - 5:30 PM, Jun 20

Practitioners, community members, researchers, and advocates have long observed challenges with federallyfinanced home buyout programs. At the same time, demand for buyouts is growing in many areas and current programs and funding sources will not be able to meet communities' and individuals' needs for relocation support. Between late 2021 and late 2022, NRDC, in partnership with FEMA, CH Consulting, the Climigration Network, and The Nature Conservancy, convened two workshop series—one with buyout practitioners and program managers, and one with buyout participants and community leaders—to discuss these shared challenges and identify practical recommendations for making buyouts faster, easier, and fairer.

In this session, we will share outcomes from the year of conversations with buyout practitioners and participants, including key recommendations from each group and highlighting areas of alignment.

N Speakers



Anna Weber Senior Policy Analyst Natural Resources Defense Council



Kristin Marcell Director Climigration Network



Margaret Osthues

Program Manager Climigration Network



Shameika Hanson Community Protection Specialist The Nature Conservancy



Carri Hulet Principal CH Consulting

2B) Climate Change Implications for Conflict Zones, Displaced Persons, Refugees, Sums Residents, and Other Involuntary Immobile Populations (World Cafe) (2) 4:00 PM - 5:30 PM, Jun 20 Climate change exacerbates preexisting habitability challenges that affect the most socially vulnerable and traditionally underserved populations worldwide. Hundreds of millions of people are currently trapped in limbo (involuntarily immobility) in precarious conditions, especially following conflict- and disaster- induced displacement. Often non-local, populations with limited mobility are at risk to exposure from unprecedented, and compound climatic hazards such as riverine flooding, drought, temperature extremes, and wildfires.

This world café format workshop – including both short expert presentations and breakout discussions – examines the environmental justice and equity implications of climate change from the perspective of exposure of marginalized communities worldwide that are not sufficiently documented and given voice to manage retreat. The session will address challenges and opportunities at local, regional, and global scales in humanitarian monitoring, governance, and legal issues to improve conditions of displaced persons, refugees, slum residents, prisoners, and other involuntarily immobile populations in the context of climate change. The world café discussion is guided by four themes along the lines of from evidence to action:

- Drivers and impacts of compound risk and vulnerability
- Challenges and obstacles (>> participants collect a set of key 'road blocks')
- Guard rails to shape opportunities ahead
- Equitable, just, and actionable policy implications

📢 Speakers



Fabien Cottier

Postdoctoral Research Scientist Columbia University



Carolynne Hultquist

School of Earth and Environment | Te Kura Aronukurangi, University of Canterbury, New Zealand



Andrew Kruczkiewicz

International Research Institute for Climate and Society, Columbia Climate School

Lisa Thalheimer

Climate Economist United Nations University



Cascade Tuholske

Asst. Professor Montana State University

2C) Interactive session: Developing a scenario game to navigate coastal managed retreat

④ 4:00 PM - 5:30 PM, Jun 20

Please note this session will be in-person only

Speaker



Rebecca Bicksler PhD Candidate University of Nottingham

2D) Supporting Our Places and People as Climate Impacts Drive Population Movement: A Session on Managed Retreat (panel) 2 4:00 PM - 5:30 PM, Jun 20 Human populations have always been on the move, seeking ideal conditions for the wellbeing of their communities. Today many communities are facing repetitive flooding, land loss, and increasing exposure to catastrophic storms, forcing them to question whether it is feasible to remain in the places they and generations before them have called home. Panelists in this session will help elucidate the current and future realities of coastal communities in Louisiana; complexities of climate-driven migration and impacts on these vulnerable communities; and lessons learned in the development of a Resilience Strategy with the Grand Caillou/Dulac Band of Biloxi-Chitimacha-Choctaw Tribe.

Session Chair: Camille Manning-Broome, President/CEO, Center for Planning Excellence

Panelists:

- Elder Chief Shirell Parfait-Dardar, Environmental and Human Rights Advocate and Cultural Preservationist, Grand Caillou/Dulac Band of Biloxi-Chitimacha-Choctaw

- Pamela Jenkins, Professor Emeritus, The University of New Orleans
- Kim Marousek, Director of Planning, Center for Planning Excellence

€ Speakers



Elder Chief Shirell Parfait-Dardar

Environmental and Human Rights Advocate and Cultural Preservationist Grand Caillou/Dulac Band of Biloxi-Chitimacha-Choctaw



Pamela Jenkins

Professor Emeritus The University of New Orleans



Kim Marousek Director of Planning Center for Planning Excellence

6:00 PM

3) Opening Plenary (2) 6:00 PM - 8:00 PM, Jun 20

6:00 PM - 8:00 PM, Jun 20
Auditorium

Wed, Jun 21, 2023

8:30 AM

4A) Utilizing a Whole-Of-Government Approach to Address Community-Driven Relocation (panel)

🕑 8:30 AM - 10:00 AM, Jun 21

The White House launched a Community-Driven Relocation Subcommittee as part of the White House National Climate Task Force in August 2022. This Interagency Subcommittee is co-led by the Federal Emergency Management Agency (FEMA) and the U.S. Department of the Interior (DOI). This subcommittee convenes federal agencies to explore key considerations, issues and strategies for community partnerships to support voluntary movement away from high-risk regions.

Interagency efforts include a new Voluntary Community-Driven Relocation program, led by the Department of the Interior, to assist tribal communities severely impacted by climate-related environmental threats. The U.S. Department of Housing and Urban Development developed a Climate Resilience Implementation Guide which provides a step-by-step guide to scoping community-driven relocation as a solution to multiple climate hazards. These efforts are only a part of the story in the Biden Administration's strategy to advance the country to build climate resilience.

Representatives from the Federal Emergency Management Agency (FEMA), Department of the Interior (DOI), Department of Housing and Urban Development (HUD), and a Tribal Nation will engage in an in-depth discussion on the range of hazard mitigation efforts utilized by the federal government to take deliberate, meaningful, and equitable actions to protect communities from the climate crisis.

📢 Speaker



Krystal Laymon Climate Team | FEMA Resilience

4B) African Experience with Managed Retreat and Climate Mobility

② 8:30 AM - 10:00 AM, Jun 21

Climate Resettlement and Livelihood Transformation in Rwanda: The Case of Rweru Model Green Village

- Lisa Dale, Columbia University
- Jola Ajibade, Associate Professor of Geography, Portland State University

This study examines whether the resettlement of communities in rural Rwanda is transformative for residents and in what ways. Using the case study of the Rweru Model Green Village and drawing on Regional Political Ecology and Sustainable Livelihoods Frameworks, we show that voluntary resettlement as an act of transformation is mediated by proximate, regional, and global factors as well as human and non-human actors that shape the process and outcome for community wellbeing and livelihood sustainability. Our semi-structured interviews with households resettled in the Rweru village revealed the double-edged nature of transformation. We observed a positive dimension which involved increased access to modern facilities and social services for two remote island communities. However, new and potentially severe livelihood constraints also emerged due to variations in climatic conditions in the originating and resettlement sites in addition to intra-community inequalities and changing market conditions exacerbated by the Covid-19 pandemic. These findings suggest resettlement as a form of transformative adaptation requires careful navigation of the complex interactions and shifts in local, regional and global political economy.

Evidence of Erosive Effects of Household Shocks on Livelihoods and Migration in East Africa

- Julia Blocher, Project Lead, Potsdam Institute for Climate Impact Research
- Roman Hoffmann, Research Scholar, The international Institute for Applied Systems Analysis (IIASA)
- Helga Weisz, FutureLab Leader/ Professor, Potsdam Institute for Climate Impact Research (PIK)/ Humboldt University in Berlin

This presentation present final results from a statistical analysis - conducted in the methodology development stage of the HABITABLE (EU Horizon 2020) project - of the cumulative impact of different types of shocks on migration, considering both environmental and non-environmental events. Previous research has shown how different types of shocks can affect migration differently, but without fully considering the impacts of the cooccurrence and accumulation of different shocks over time. Using panel models and longitudinal data from the Tanzania National Panel Survey (TZNPS) between 2008 and 2013, we show that environmental and nonenvironmental shocks are closely related and can influence migration patterns over time. Our findings indicate substantial migration impacts of environmental shocks on migration when we distinguish different contexts and different shock types. The impacts are particularly strong for shocks that have occurred within 24 to 36 months prior to the interview date. Results are more concise in models controlling for the occurrence of previous shocks, highlighting the need to consider the wider temporal context and to account for potential dependencies in the occurrence of shocks over time. Moreover, we find evidence that co-occurring shocks can reinforce each other, increasing the effects on mobility. This research contributes to current understandings of migration as a "last resort" and expands our conceptualization of habitability to include non-environmental factors. The presentation will also comment on observations from research in five African countries for the on-going HABITABLE (EU Horizon 2020) project, to which this study has contributed.

Weather shocks, crop price and migration in West Africa: Insights from high-frequency largescale surveys

- Fabien Cottier, Postdoctoral Research Scientist, Columbia University
- Alex de Sherbinin, Deputy Director CIESIN and Senior Research Scientist, Columbia University
- Richard Seager, Lamont Research Professor, Columbia University
- Elizabeth Leong, Graduate student QMSS, Columbia University
- Elizabeth Nguyen, MA candidate, Climate & Society, Columbia University

How do weather shocks and food security influence human migration in West Africa? Despite a growing literature on environmental migration, research on the influence of the environment on migration has remained stymied because of a lack of high-quality empirical data, in particular when it comes to South-South migration, such as in West Africa. In fact, systematic data on migration in Africa primarily come from censuses, whose quality and frequency vary significantly from one country to the next. Here, we draw on novel data collected by the International Organization for Migration (IOM) from a network of migrant transit nodes throughout West African based on random rolling surveys of migrants. Unlike migration data derived from censuses, these data make it possible not only to examine the effects of weather shocks on permanent international migration, but also compare it to seasonal and internal migration. Using these unique data, we examine to what extent drought and food price shocks influence migration in West Africa. We show that migration in the region is indeed influenced by weather shocks, with seasonal and short-distance migration more so than permanent long-distance migration.

Humanitarian Urbanism: How Multiple Risks of Climate Change and Land Degradation Overburden Cities in the Edge of Sahara

• Aliyu Barau, Professor, Bayero University Kano

Many arid sub-Saharan African countries are experiencing slow-onset processes - droughts and desertification – which are the main drivers of cross-border population displacements. This paper examines the experiences of

Kano City in Northern Nigeria with respect to how Tuareg migrants create humanitarian urbanism characterised by poor and unsecured shelter system. This development creates new burdens on urban areas and governments that are already dealing with multiple urban sustainability crises. It is clear that appropriate policies are lacking between governments of the affected countries in matters concerning the plights of environment migrants from their places of origin into foreign cities and towns. This study has further strengthen the notion that in the drylands of Sub-Saharan Africa, droughts and desertification may not be the only triggers for population displacement, it is possible that conflicts associated with dwindling resources and worsening poverty will also complicate how climate change will expel people to cities. Finally, it is important to stress that it is crucial for developing countries to embrace the Nansen Initiative and integrate it with shelter targets of the SDGs in order to streamline protection of environmentally displaced persons. This study strongly argues that such initiatives should accord more attention to urban areas with a view to seeing how they can accommodate environmental refugees without compromising sustainability and their rights to the city.

A Field Perspective on Urban Climate Migration Governance

• Susan Ekoh, Researcher, German Institute of Development & Sustainability

About half of the world's population is estimated to inhabit cities, with projections showing growth in the future (OECD/EU Commission, 2020). In Africa, 44% of the population is estimated to live in cities (UNCTAD e-Handbook of Statistics, 2021). Climate change is likely to influence the demography of cities (OECD/EU Commission, 2020) as people migrate to cities (see: Adri & Simon, 2016; Chawla, 2017), but also from cities (see: Hauer, 2017), and within cities (see: Ayeb-Karlsson, 2021). Cities play a critical role in both migration (Thouez, 2020; Pejic, 2021) and climate change governance (Castán Broto & Westman 2020) and this is increasingly being recognized. Hence, the intersection of urbanization, climate change and migration becomes even more vital to consider (DePaul, 2012; Rana & Ilina, 2021), especially for major cities in Africa that accommodate economically and socially vulnerable populations. According to Schraven et al., (2019), the intersection of climate induced-mobilities are complex and governance across the two critical issues is not well coordinated. To contribute to this relevant area of research, this paper adopts a political economy analysis approach to interrogate the politics, power and interests that shape urban climate migration governance. Through expert interviews with political and social actors in two West African cities, the paper assesses the determinants of urban climate migration governance. Emerging results show that attention to the issue of climate-induced migration in Accra and Dakar, is still in its infancy. Limited resources and capacity means that cities rely on partnerships with external donors and networks to support the design and implementation of climate migration policies and programs. Furthermore emerging findings suggest the need for better coordination across levels of governance and actors in the area of climate-induced human mobility. These results are relevant for stakeholders and policy makers working in the area of climate migration governance, given the role that migration plays in climate adaptation for many individuals and communities.

Keywords: human mobility, climate adaptation, urban governance, coastal cities

References:

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Speakers

Lisa Dale Columbia University

Juli
Proje

ulia Blocher

Project Lead Potsdam Institute for Climate Impact Research (PIK)/ Humboldt University in Berlin



Fabien Cottier Postdoctoral Research Scientist Columbia University



Aliyu Barau Professor Bayero University Kano



Susan Ekoh Researcher German Institute of Development & Sustainability

4C) Receiving Communities

🕑 8:30 AM - 10:00 AM, Jun 21

Understanding climate migration receiving communities through a migration systems framework

• Kathryn McConnell, Postdoctoral Research Associate, Brown University Population Studies and Training Center (presenting)

• Elizabeth Fussell, Professor of Population Studies and Environment and Society, Brown University Population Studies and Training Center

Climate change scholars and practitioners are increasingly arguing for greater attention to "climate migration receiving communities" - the geographic destinations to where migrants move. Two primary typologies of receiving communities tend to dominate current discussion of climate migration destinations: sudden-influx receiving communities, in which a rapid-onset event results in the movement of a large number of migrants to the same destination, and self-branded receiving communities, in which destinations actively describe themselves as climate havens in a bid to grow their population. While an important starting point, we argue that these conceptualizations of "receiving community" are overly narrow, limiting our understanding of the ways that many, diverse communities are and will be influenced by climate change through in-migration. Many of the influences of climate change on destinations will likely be subtler and less immediately visible than sudden-influx and self-branded sites. Future research on receiving communities can do three things to advance a more robust understanding of receiving communities: (1) draw on a migration systems framework, (2) attend to less-visible cases that are neither sudden-influx nor self-branded, especially those related to slow-onset environmental changes, and (3) always consider "climate migration" in the context of larger population trends.

Climate-Induced Human Migration in the Great Lakes Region

• Katherine Bunting-Howarth, Associate Director of New York Sea Grant and Assistant Director of Cornell

- Cooperative Extension (presenting)
- Andrea Harder, University at Buffalo

Changing atmospheric conditions and environmental processes will continue to impact the habitability of coastal communities throughout the United States. By the end of the century upwards of 13 million U.S. residents could be displaced as a result of sea level rise (Hauer et al., 2016). The Great Lakes region is often described as a future climate destination due to its northeastern and midwestern location, an abundance of freshwater resources, and room to accommodate growth following post-industrial population declines.

Despite increased reference to the link between climate change and human mobility (which includes displacement, migration, and planned relocation), there is a lack of knowledge regarding how climate-induced population shifts will impact socio-economic and ecological processes in both sending and receiving communities, what will be required to adapt to those impacts, and how we can ensure the resilience of our communities.

PEople on the MOve in a Changing Climate (PEMOCC) was funded by the National Science Foundation (NSF) to highlight the current state of knowledge on climate-induced human migration, provide the scientific infrastructure that is required to conduct place-based research, and develop context-specific strategies and solutions in collaboration with coastal stakeholders. A Great Lakes regional workshop, hosted by New York and other Great Lakes Sea Grant Programs, was held in Buffalo, NY June 1-3, 2022. Policymakers, researchers,

educators, and experts from a variety of backgrounds gathered to discuss the unique climate migration-related opportunities and challenges that are anticipated in the Great Lakes region. This presentation will present outcomes of the regional meeting including data and research gaps, strategies for education and engagement, and policy needs.

Receiving: Addressing Climate Gentrification in Real Estate

• Lian Plass, Senior Manager, Urban Resilience, Urban Land Institute

Climate gentrification, a phenomenon characterized by growing real estate investment and spiking prices in areas with lesser risk to climate change impacts, is anticipated to affect communities more and more in the coming years. Most agree that gentrification can both benefit and harm communities, and recent ULI publications have emphasized the importance of creating conditions for "gentrification without displacement". Just as gentrification on its own can be a double-edged sword, climate gentrification too presents both opportunities and challenges for both vulnerable populations and new residents. As housing and goods and services become more expensive, competition for public resources increases, and community character changes in concert with demographics, private sector stakeholders and public officials may experience difficulty navigating a changing development landscape.

Understanding how to facilitate equitable growth, prevent disinvestment, and protect and preserve existing communities is critical in addressing the issue of climate gentrification. This can be a complex task, as new residents bring with them new demand for housing and public services, as well as competition for resources. Private sector stakeholders and public officials may face difficulties in navigating a changing development landscape and turning new sources of demand into opportunities to revitalize, protect, and preserve existing communities.

The report on which this session proposal is based will be published in March, and will serve as a primer on climate gentrification for public officials, developers, and investors seeking actionable solutions in the face of climate change within the communities in which they work (see session outline below). This session will highlight the report's key takeaways, including the fact that climate gentrification can occur due to international, inter-state, regional, and local movement of people, and that gentrification-driven displacement can be caused by a range of factors, some of which can be difficult to attribute directly to social, economic, and environmental factors—both direct and indirect. It also emphasizes the importance of considering both the ways in which new development might influence these factors in vulnerable communities and alternatives that can help to mitigate adverse impacts.

In addition to highlighting these key takeaways, the session will also discuss regional and local factors contributing to climate-related displacement pressures in locales such as Philadelphia, Miami-Dade County, Boston, Northern California, and New York City, alongside ongoing measures to combat adverse impacts. This session will delve into the findings and methodology of the report, providing a comprehensive overview of the issue of climate gentrification in the real estate industry. It will discuss the impacts of new residents on housing and public services, changing demographics, and threats to longtime residents. We will also explore strategies for facilitating equitable growth, preventing disinvestment, and protecting and preserving existing communities.

Policy and Governance Solutions for Receiving Communities

• Ira Feldman, Founder & Board Chair, Adaptation Leader

This presentation will focus on the challenges that "receiving communities" or "climate havens" will increasingly face in North America due to climate-induced migration in the U.S. and Canada. The legal, policy, and governance dimensions of internal displacement are only now slowly coming into focus. Much more study and planning will be needed.

The presenter, Ira Feldman, and his not-for-profit Adaptation Leader are already setting the research and policy agenda for receiving communities and developing support services for communities that -- willingly or unwillingly -- are viewed as climate havens. Some communities are encouraging in-migration; other receiving places are not viewing the prospect of newcomers due to climate displacement as a positive.

Adaptation Leader established an interdisciplinary working group on receiving communities in 2022, which assessed the potential for domestic displacement and considered a range of path-forward options. These options, much like climate adaptation itself, are context dependent. The team is developing solutions for both underpopulated urban settings and rural greenfield solutions.

While recognizing the serious humanitarian concerns associated with the international migration of climate refugees, the Adaptation Leader team is focusing on the urgent need to prepare for internal displacement. Few have given serious thought to receiving communities, and, as a result, we are woefully unprepared. This presentation will position the receiving communities discussion as the "back end" or "flip side" of managed retreat a conversation that has received inadequate attention to date.

This presentation will explore the interplay between local, state, regional, and national governance and the prospect for interstate arrangements, federal policy, and legislation. The presentation will evaluate the potential role of public-private partnerships in addressing internal displacement. Finally, the presentation will give voice to the perspectives of current residents in perceived climate havens, including gentrification and other equity concerns.

The complexity of the receiving communities conversation will require the engagement of multiple disciplines

and skill sets to build capacity. While ad hoc efforts are essential to developing leading practices and standards, this presentation will posit that a more coherent policy-based approach must guide the next phase of pilot projects and regulatory test beds for receiving communities.

This presentation will share the recommendations from the Adaptation Leader working group and preview a forthcoming article to be published by the Environmental Law Institute.

The Northeast as Climate Refuge? Migration Histories and Future Prospects

· Linda Shi, Assistant Professor, Cornell University

As climate impacts intensify across the United States, scholars and policymakers increasingly anticipate inmigration into the Northeast due to the perception and reality that this region has more water, more undeveloped land, and cooler temperatures. How ready is the region for in-migration given existing housing and infrastructure needs, the state of public and nonprofit institutional support systems, and societal openness to migrants? We respond to these questions by sharing early findings from the NOAA-funded planning project, A Northeast Safe and Thriving for All (NEST), which aims to help NOAA assess if it should fund a regional partnership on climate migration in the Northeast. We will highlight how communities in the region have responded to migrants in the past. Examples include the Great Migration of French Canadians to Maine, Great Migration of African Americans to New York, deindustrialization and depopulation across the region, refugee resettlement in Lewiston and Buffalo, and COVID-19 migration. Drawing on literature reviews and interviews and workshops with key stakeholders, we reflect on what historic and ongoing struggles to care for existing and new residents means for future in-migration into the Northeast. We also show how most climate, economic, and housing policies in the Northeast currently do not anticipate these challenges. We close by discussing examples of communities that are working to encourage economic growth, address housing unaffordability, and attract future climate movers, and what that suggests for future policy development.

📢 Speakers



ell Postdoctoral Research Associate Brown University Population Studies and Training Center



Katherine Bunting-Howarth Cornell University - NY Sea Grant



Lian Plass

Senior Manager, Urban Resilience Urban Land Institute



Ira Feldman Founder & Board Chair Adaptation Leader



Linda Shi Assistant Professor Cornell University

4D) Environmental Justice and Equity

2 8:30 AM - 10:00 AM, Jun 21

The challenges for Managed Retreats in South Asia: Evidence from Sundarbans and Kuttanad

• Ajmalkhan Areethala, Postdoctoral Fellow, Harvard University

Managed Retreat as an idea has not yet reached most of the underdeveloped and climate vulnerable regions in the world such as South Asia. As countries that have long coastal regions and vulnerable fishing communities, the managed retreat is certainly important for these countries and communities. My paper asks what are the challenges to managed retreat in South Asian countries that are not only climate vulnerable but has large populations of indigenous and fishing communities, and how and why concepts like managed retreats will have to be redefined in such regions. This paper focuses on two distinct climate-vulnerable regions in India, the world's largest area of mangrove forests in the Bay of Bengal and the Kuttanad region in the Indian Ocean where rice cultivation takes place below the sea levels as part of the Globally Important Agricultural Heritage System. Based on the ethnographic fieldwork among the indigenous and lower caste communities in these two sites, I demonstrate the peculiar changeless faced by the most vulnerable communities where they negotiate between the changing climate, the state led disaster management and climate adaptation projects, and their community adaptation (survival) strategies informed by both the indigenous knowledge and science. My paper argues that managed retreats in such locations need to take the local contests, communities (indigenous and lower caste), and

their ecological relations and vulnerabilities into consideration. Hence, the managed retreat needs to be indigenized for South Asia.

Racial Disparities in U.S. Climate Migration

- Gabriela Nagle Alverio, Duke University
- Dr. David Leblang, Ambassador Henry J. Taylor and Mrs Marion R. Taylor Endowed Professor of Politics, University of Virginia

In the wake of Hurricane Katrina, 56 percent of Black Louisianans did not return to New Orleans, instead migrating to other parts of the state and region. Since then, a narrative around U.S. climate migration has become prevalent, suggesting that in the face of climate impacts White populations will stay in place and Black populations will be forced to migrate. To date, several studies have analyzed aggregate climate migration patterns across the U.S. and others have assessed climate migration patterns by race at the case study level. However, no research that examines the prevailing notion about climate migration patterns by race across the U.S. exists. Our paper fills this gap by utilizing county-level flood and migration data to analyze migration patterns by racial group. Results suggest that the prevailing Katrina narrative is entirely inaccurate: Black populations are trapped in the face of floods, while White populations are more likely to migrate after a flood. We conduct sub-analyses based on geographic features including coastal vs. non-coastal; urban vs. rural; and FEMA or First Street flood plain vs. non-flood plain. Racial disparities in migration persist even when taking these variations into account. In order to assess potential mechanisms for this outcome, we analyze the effect of FEMA funds on out-migration. We find that as FEMA funds increase, Black out-migration increases while White out-migration decreases, suggesting a potential climate gentrification effect. This trend, however, flips in coastal counties. Though we are unable to definitively say why these disparities exist, we conduct an in-depth literature review on likely mechanisms, including FEMA policies, flood insurance, and on-going systemic racism in the real estate market.

Guardians of the Gulf: a coastal and human resiliency-focused STEAM program for underserved youth

- Sarah Grasty, Project Manager, University of South Florida, College of Marine Science/Guardians of the Gulf
- Kristen Kusek, Director of Strategic Communications, USF College of Marine Science/Guardians of the Gulf

The University of South Florida's College of Marine Science (USF CMS) has begun to build Guardians of the Gulf: a STEAM program for underserved youth focused on coastal and human resiliency in partnership with the Boys & Girls Clubs of the Suncoast (BGCS) and the St. Petersburg Innovation District. Solutions to coastal and broader climate challenges demand diverse perspectives, participatory action-planning, cross-disciplinary, innovative solutions - and all-hands-on-deck action. However, not all hands are on the deck. The program sits at the nexus of science, resilience, workforce development, and equity. It takes a multisensory approach to engage and impact as many youth participants as possible through different types of learning. Guardians content combines web-based educational experiences with hands-on activities, place-based field trips, and action projects designed to reinforce concepts, stimulate inquiry, and sustain engagement. Our vision of a fully funded program is a gamified, "fun first," one-week experience (5 days) with touchpoints throughout the year that is low-cost, modular, and useable by any out-of-school institution. As the program grows, we aim to build a connected community of Guardians across the state of Florida, the Gulf of Mexico, and beyond. Our goals are to introduce youth at an early age to the interconnectivity of our natural environment, empower them to realize what's at stake, inspire them toward action and stewardship, and expose them to STEAM career possibilities. Their future, and Florida's, depend upon it. To date we have run two camps that have provided several lessons learned. In our presentation, we will share and showcase key milestones and in hopes of building synergy with other resiliencyfocused programs for youth, including:

- Development of an augmented reality app prototype about coastal resiliency

- A youth-friendly GIS portal for data collection
- A youth-friendly video and activity module that covers green and gray infrastructure

- And more!

Projecting Health Impacts of Changing PM2.5 Emission Profiles Due to Climate Migration

• Chris Whitehead, Lead, air compliance practice, ESI

Managed retreat is a controversial topic. So is climate migration, but both are very real responses to decades of nearly unmitigated fossil fuel consumption and associated atmospheric warming. Whether we like it or not future populations will not be living precisely where we currently live. Land will be lost to coastal flooding, sea level rise, wildfire, drought, and a litany of other related causes. On top of the losses in viable land, population is projected to boom in coming decades. It stands to reason that distances from major emission sources (Title V facilities) will shrink over time. These major sources are governed by the projected annual emissions of criteria contaminants and if applicable hazardous air pollutants (HAPs). Any new permitting or major revisions will have to go through air dispersion modeling to project impacts to any local sensitive receptors. PM2.5 emissions have been directly linked to childhood asthma and multiple other respiratory illnesses. The EPA recently proposed a revision to the PM2.5 national ambient air quality standard, down from 12 micrograms/cubic meter to 8 or 9 micrograms. This change is projected to reduce early deaths related to respiratory illness by 4X.

My presentation will detail energy justice work that I have been doing for the Philadelphia and Southern New Jersey region. Using Philadelphia as a case study, I will model potential managed retreat scenarios in InMap. As the city's population grows and gets more consolidated, what will that do to projected PM2.5 impacts in the area?

If we can project a future issue, we can also project a range of solutions.

Environmental Justice is Racial Justice

- · Aviva Rahmani, Ghostnets
- Charlene Stevens, Arcade Project

€ Speakers

Ajmalkhan Areethala

Postdoctoral fellow Harvard University



Gabriela Nagle Alverio

J.D.-Ph.D. Candidate Duke University



Sarah Grasty Project Manager Univ. of S. Florida, College of Marine Science/Guardians of the Gulf



Chris Whitehead

Potential Air Impacts from Managed Retreat and Climate Migration: A Case Study of PM2.5 in Philadelphia ESI



Aviva Rahmani

Ghostnets



Charlene Stevens

Arcade Project

10:30 AM

5A) Migration as adaptation or maladaptation

② 10:30 AM - 12:00 PM, Jun 21

Environmental shocks and migration among climate-vulnerable populations in Bangladesh

• Jan Freihardt, PhD Candidate, ETH Zurich

Various studies predict large environmental migration flows due to climate change, yet the ex-post empirical evidence for such migration is inconclusive. I examine the causal link between environmental changes and migration drawing on the theoretical framework of the need, desire, and ability to move of affected populations. The analysis relies on original survey panel data of 1700 households residing along the Jamuna River in Bangladesh, an area heavily affected by environmental changes, in particular floods and riverbank erosion. Controlling for individual level characteristics such as gender, age, risk attitudes, and migrant networks, I relate respondents' perception of riverbank erosion and floods (need), migration aspirations (desire) and education/occupation/wealth (ability) to their likelihood to move away from their place of origin. I find that erosion significantly increases the propensity to migrate, while flooding has a significant effect only if it leads to severe and irreversible impacts. These findings have significant policy implications by underlining the nuanced relationship between different types of environmental shocks and migration, which should be reflected in policies aiming at supporting populations-at-climate risk.

Translocal social resilience dimensions of migration as adaptation to environmental change

- Harald Sterly, Senior Scientist, University of Vienna (presenting)
- Patrick Sakdapolrak, University of Vienna
- Marion Borderon, University of Vienna

There is growing recognition of the potential of migration to contribute to climate-change adaptation. Yet there is limited evidence to what degree, under what conditions, for whom and with which limitations this is effectively the case. We argue that this results from a lack of recognition and systematic incorporation of socio-spatiality – the nested, networked and intersectional nature of migration-as-adaptation. Our central objective is to utilize the translocal social-resilience approach to overcome these gaps, to identify processes and structures that shape the social resilience of translocal livelihood systems, and to illustrate the mechanisms behind the multiplicity of possible resilience outcomes. Translocal livelihoods constellations anchored in rural Thailand as well as in domestic and international destinations of Thai migrants serve as illustrative empirical cases, based on data that

was gathered through a multi-sited and mixed-methods research design. Our contribution highlights the role of the distinct but interlinked situations and operational logics at places of origin and destination, as well as the different positionalities and resulting vulnerabilities, roles, commitments and practices of individuals and households with regard to resilience. Based on the empirical results, we distill a generalized typology of five broad categories of resilience outcomes which explicitly considers socio-spatiality. Our approach helps to grasp the complexity of migration-as-adaptation and to avoid simplistic conclusions about benefits and costs of migration for adaptation – both of which are necessary for sound evidence-based migration-as-adaptation policymaking.

Climate Change, Migration and Adaption in Oceania

· Juliette Budge, Resilience Researcher, Climate Resilience Collaborative, University of Hawaii, Manoa

Pacific island countries and territories are being increasingly affected by rising temperatures, more intense tropical cyclones, sea level rise (SLR) and storm surge, drought and changing rainfall patterns, and coral bleaching. Continued SLR may increase marine inundation of coastal roads, port facilities, coastal wetlands and groundwater systems. Island communities are located at the intersection of intensifying storm runoff and rising ocean waters. Atolls are especially exposed to the effects of SLR in the form of shoreline erosion, inundation, and saltwater intrusion into fresh groundwater. Several studies explore climate driven impacts and other environmental factors on the resilience of low-lying islands.

Currently climate change does not rank as a top motivation for movement from smaller islands to higher groundthose drivers are more likely to be education, employment and healthcare. However, in Oceania there are indicators that tell of quickly approaching environmental shifts that will most likely increase human movement in this region. There is robust data on climatic changes happening in the Pacific. The research provides critical information for understanding the timing and magnitude of climate change impacts on atoll islands that will result in significant, unavoidable geopolitical issues if it becomes necessary to abandon and relocate low-lying island states. And islanders are facing an existential threat, but the narrative is more complex than climate change forcing migration. It asks us to consider adaptive strategies beyond the geography of their home islands.

Islands in Oceania are often described as highly vulnerable and lacking adaptation options. These descriptions neglect the fact that Pacific Islanders, by many different metrics, are leading climate action and combining their systems of knowledge with more western science to create relevant climate solutions. The reluctance to recognize the many ways Oceanic communities adapt and build resiliency demonstrates the beginning of a cognitive bias that is limiting to sustainable climate solutions for everyone.

This bias becomes more entrenched when the topic of migration is considered. Moral obligations aside of who caused climate change and who is suffering from its consequences-the narrative around climate migration has long been sensationalized and scandalized. Some worst-case scenario projections of sea level rise estimate that globally 2 billion people will be forced to relocate by 2100. These fearful discourses create the foundations in receiving communities for anti-immigrant sentiments and policies.

Previous research has demonstrated that fundamentally, Pacific Islanders do not want to be portrayed as refugees. While the term "environmental refugees" has been used in global discussions, and sometimes to describe migrants in Oceania, it is not representative of their status, nor experiences. The term removes any agentive characteristics from the islanders. This element of forced migration associated with refugee status is problematic and considered undesirable, both for sending and receiving communities. The drivers of migration in Oceania are diverse, and the historical choices for movement are equally varied. As many islanders and observers would point out, migration has always been a part of their society and culture. This is evidenced in resettlement in search of better food sources and the traditional practice of voyaging, as taught by Papa Mau.

Despite migration being considered an agentive choice, any island nation government will explain, it is not their first choice for their people when addressing climate change. Individuals often do not want to leave their customary lands. In this research we use the Compacts of Free Association, the migrants who move under its obligations to them, and the receiving communities to understand how climate change and adaptation are interconnected to movement in Oceania.

Planning for Climate Mobility: From Informed Decisions to Collective Action

Sarah Rosengaertner, Global Knowledge & Practice Lead, Global Centre for Climate Mobility (GCCM)

This presentation will focus on the work of the newly established Global Centre for Climate Mobility (GCCM) generating evidence and mobilizing collective action to address the impacts of climate change in some of the most vulnerable countries and world regions (Africa, Greater Caribbean, Pacific) where people are already compelled to move due to climate impacts and entire nations face certain displacement this century. Their situation cannot be accounted for with the tools of migration governance, including planned relocation alone. Larger questions of climate justice and climate adaptation, economic transformation, preserving cultural heritage and identity, and maintaining statehood arise. The presentation will discuss findings and lessons learned from the GCCM's work with regional organizations and national and local governments, the UN, stakeholders, and the scientific community to build knowledge on regional climate mobility dynamics, develop policy blueprints and a community of practice, and ultimately foster political momentum for addressing climate mobility and people's right to remain in place as the local, national, regional and global collective action challenge that it is.

Trapped by climate change? Linking migration aspirations to actual moves among a climate-vulnerable

population in Bangladesh

• Jan Freihardt, PhD Candidate, ETH Zurich

While the academic literature agrees that climate change will alter migration patterns, it has been inconclusive about how it will do so. For examining how environmental changes translate into migration, one needs to consider both migration aspirations and the ability to move of affected populations. I investigate which factors condition whether environmental changes lead to actual moves by collecting primary survey panel data of 1700 households residing along the Jamuna River in Bangladesh. I assess baseline migration aspirations of a population at risk of being affected by riverbank erosion and floods. Re-interviewing the same population after erosion and floods have materialized, we can assess whose aspirations turned into actual moves and whose did not. We find that migration materializes only for a small fraction of those who had expressed a desire to move at baseline. Socioeconomic status and social networks are important conditioning factors influencing an individual's ability to move. Our findings have significant policy implications since they provide guidance how to support the most vulnerable parts of populations at risk of becoming trapped in unfavorable environmental conditions.

Speakers



University of Vienna

Resilience Researcher Climate Resilience Collaborative, University of Hawaii, Manoa



Sarah Rosengaertner Global Knowledge & Practice Lead

Global Centre for Climate Mobility (GCCM)

5B) Institutional and Legal Aspects of Managed Retreat

I0:30 AM - 12:00 PM, Jun 21

What is moved in a retreat and who moves these activities? What planners need to know

- · Karen O'Neill, Associate Professor in Human Ecology, Rutgers University
- Heather Fenyk, President, Lower Raritan Watershed Partnership

Because coasts are socially and economically vital regions, retreat from a coastal site could affect many human activities and uses that involve many institutions. Retreats therefore extend beyond the scope of coastal management and land use planning. Planners are integrated into these two professional practices. They increasingly recognize that coastal change requires the full range of planning approaches, including national and regional spatial planning, housing policy, workforce development, and economic development.

To consider these needs, we asked what activities and uses are being moved from coasts, and who is moving them? To answer these questions, we did a desk analysis of sixty cases of coastal retreat around the world, focusing on moving projects that institutions sponsored. Sponsors take on some or all responsibility to fund or organize a retreat or relocation (Hino et al., 2017). Sponsors may aim to meet a broad institutional aim, such as managing hazards, and in many cases they may also aim to assist people who retreat. We analyzed what uses and activities were moved, which types of institutions became sponsors, and whether the mix of institutions changed over the course of the project.

The analysis found that sponsors included various government bureaus and other institutions, depending on what was being moved. For instance, several projects that moved people from eroding communal lands were sponsored by the clans that managed those lands; these projects were joined later by government agencies that clans solicited for funding and logistical help. In another case, a highway agency and a coastal management agency relocated an eroding road and removed nearby houses, with compensation and aid to the owners.

Nearly all moving projects used the institutions at hand. That is, only a few projects were sponsored by institutions created for the purpose of promoting coastal adaptation. For all other projects, the sponsoring institutions were built to serve other purposes and had to change in some fashion to take on the retreat project. There were several patterns of change. First were sponsors like municipalities and coastal agencies that were historically devoted to using coasts intensively. After years of pursuing practices that unintentionally created hazards, these institutions tried a different approach, at least at one coastal site, by sponsoring a retreat. Second, some institutions had little experience managing coastal sites but sponsored a site retreat when conditions affected their operations, including parks agencies, agricultural agencies, a nuclear agency, tribal governments, and water

and electric utilities. Third, some humanitarian organizations sponsored retreats to help people at those sites, as an extension of their other aid work. Fourth, other humanitarian services gave ad hoc support when problems emerged; most typically, social services agencies or disaster aid organizations that did not originally sponsor the retreat stepped to help people who were displaced by a project and unable to manage their own relocation.

Theories aim to explain why institutions like these are stable but also why they might change (Acemoglu and Robinson, 2008; Clemens and Cook, 1999). It is important to promote changes in institutional aims for vulnerable sites by investigating how previous retreats have managed to move multiple activities affecting multiple institutions. Ad hoc approaches to retreat are likely to be delayed, disruptive, and risky (Hanna et al., 2020). We reflect on the results of this analysis by applying principles of planning practice that could promote changes in coastal institutions likely to sponsor retreats.

Acemoglu, D., Robinson, J.A. (2008) The Persistence and Change of Institutions in the Americas. Southern Economic Journal, 281.

Clemens, E.S., Cook, J.M. (1999) Politics and Institutionalism: Explaining Durability and Change. Annual Review of Sociology 25, 441-466.

Hanna, C., White, I., Glavovic, B. (2020) The Uncertainty Contagion: Revealing the Interrelated, Cascading Uncertainties of Managed Retreat. Sustainability 12, 736.

Hino, M., Field, C.B., Mach, K.J. (2017) Managed retreat as a response to natural hazard risk. Nature Climate Change 7, 364-370.

Institutional transition in managed retreat: Moving from a local, rights-based approach toward a centralized, process-centric approach

• Ju-Ching Huang, Maryland Sea Grant Legal and Policy Fellow & SJD Candidate, Georgetown Law Center

The approach to managed retreat in the United States, particularly related to land use and planning, is shifting in two important ways. Local controls and individual rights protection are the two main features in the current landuse regulatory regimes. The opposites of these two concepts are centralization and a process-based approach. Local–federal describes the dynamics between the decision makers, and rights-based–process-centric describes the focus of the decision-making process. Through the case of Crisfield, Maryland, this research illustrates the shift and provides relevant insights about the issues involved.

In the United States, land use control powers are mostly delegated by state legislatures to local governments. Land use and development is regulated at the state and local level through regulatory ordinances such as zoning, building code, subdivision, critical area, floodplain, stormwater management, and sediment and erosion control. Land use control regulations such as creating setbacks, setting stricter building codes, and restricting development density have been among the most used and advocated managed retreat tools. However, given the temporal and spatial scale of climate change, many local governments lack capacity to address managed retreat—they are understaffed and lack expertise in how to protect their people, or perhaps even cities themselves. Some cities are hesitant to adopt stricter land use regulations as they might hurt local economic opportunities. This research examines the roles of local and federal governments in the context of managed retreat and argues that the federal government is playing an increased role and exerting a greater influence on local decisions. It is worth noting that to focus on the local-federal dynamics, this research does not directly address the role of state government.

In addition to the roles of local and federal control, another important consideration is the balance of rightscentric and process-based decision-making. As important as it is to protect individual rights (such as property and housing rights), a rights-based decision-making approach can often result in piecemeal decisions and failure to take a holistic view for long-term, sustainable land-use decision making. From restrictive development to buyout projects, in most cases the central issue comes down to whether the decisions will deprive people of their property rights. In many underserved or low-income communities, no property rights are involved; relocation can protect their safe and affordable housing rights – another important concern – but might result in the loss of intangible assets such as community ties. Therefore, rights-based decision making might not be helpful in terms of building equity. This research argues that a process-centric approach that focuses on building a dynamic decision-making process is crucial to ensure that decisions are being made in a holistic manner.

Case Study of Crisfield, Maryland

This research uses the City of Crisfield, Maryland as a case study to illustrate the power shifting, process-centric decision-making approach outlined above. Crisfield is a low-lying, flood-prone, low-income (around 34 percent of residents are below the poverty level) city; it has an inadequate and ill-maintained drainage system and antiquated water and sewer system. The cost of housing elevation is rather prohibitive and is higher than the fair market value of the houses themselves. The city is also facing recessed economic development with a shrinking tax base as people are moving out of the city (around 10 percent over the last decade). For the city, reviving the economy and attracting more people to come and stay in the city is the priority. However, this goal might not be attainable as the fundamental question regarding the frequent flooding issue and land subsidence has not yet been resolved.

In 2022, Crisfield was first selected as one of the 20 sub-applicants in the nation to receive Direct Technical Assistance from the Federal Emergency Management Agency. While some might argue that this federal assistance is merely technical, it can be deemed a breakthrough that illustrates the institutional transition from local control to federal management. Even if the local government is still in control of land use decisions, federal involvement can have an invisible influence on the local land use floodplain management regulations.

As an example of managed retreat, Crisfield is also unique in that the composition of dwellers in the city means that a solely rights-based consideration or solution would not be effective. Around 46 percent of households are

owner-occupied and 54 percent are renter-occupied. One-third of the population lives in public housing. Given this high percentage of renters in Crisfield, housing rights play a critical role. Following severe flooding that resulted from Hurricane Sandy in 2012, the relocation of public housing was briefly studied in 2015, but not much has changed thus far. Relocation of public service institutions such as a hospital is also being considered, which could impact residents' access to essential services. As a managed retreat approach is being explored, a robust, holistic process that addresses issues beyond rights protection must be considered. Lessons learned in Crisfield can provide insight to other communities facing similar issues with regard to managed retreat.

Armor or Withdraw? Likely Litigation and Potential Adjudication of Shoreland Conflicts Along Michigan's Shifting Great Lakes Coasts

- Richard Norton, Professor of Urban and Regional Planning, University of Michigan
- Guy A. Meadows, Professor, Marine Engineering, Michigan Technological University
- Oday Salim, Director, Environmental Law & Sustainability Clinic, University of Michigan School of Law
- Matthew Piggins, University of Michigan
- Philip Washburn, University of Michigan
- Lauren Ashley Week, J.D. and M.U.R.P. Candidate, University of Michigan

Michigan enjoys along its inland seas, the Laurentian Great Lakes, one of the longest coastlines in the U.S. Much of that shoreline is privately owned. Because of a confluence of development pressures and irrepressible physical dynamics, growing numbers of Great Lakes shoreland properties and structures, built on shifting sandy shores, are at heightened and accelerated risk of loss from coastal storm surge, inundation, erosion, and shoreline recession—a phenomenon akin to sea level rise on ocean coasts. In response, property owners are installing extensive hardened shoreline armoring structures like seawalls and revetments to arrest those erosional processes. Those structures, however, will substantially impair, if not ultimately destroy, the state's natural coastal beaches and other shoreland resources, as well as accelerate erosion of neighboring shoreland properties.

The clash of imperatives to protect shoreland properties versus conserving coastal resources signifies a wicked dilemma the State cannot avoid: armor or withdraw? More precisely, should the State allow the continued armoring of Michigan's Great Lakes shorelines in an attempt to fix in place shoreland properties, at great and ongoing private and public expense, and ultimately risk the loss of public trust resources? Or should it allow—and should it compel shoreland property owners to allow—natural processes to proceed, even though doing so will result in the natural conversion of privately owned shorelands into State-owned submerged bottomlands sooner than would otherwise occur? The State and its citizens cannot hope to simultaneously protect both the beach and the beach house along naturally receding Great Lakes shorelines; they must choose which interest to prioritize first, recognizing the cost of doing so by losing the other.

In addition to the complex physical dynamics at play along Michigan's Great Lakes coasts, the shoreline is subject to evolving legal complexities as well. The State, as sovereign, enjoys police power authorities that speak to coastal shoreland management. Because shoreline dynamics along the Great Lakes are more like those along oceans than inland lakes, the State has also long recognized the applicability of the public trust doctrine to its Great Lakes shores. In addition, the Michigan Constitution includes a mandate to protect the state's natural resources from pollution and impairment. Our assessment of Michigan law with respect to Great Lakes coastal shores is that Michigan's courts, state legislature, and people have consistently and clearly prioritized protecting and conserving the Great Lakes' natural coastal resources—the beaches—above developing or impairing them for private use, except when such development truly serves larger public trust interests. The administrative rules now used to execute those protections, however, prioritize protecting the private beach house first, even at the expense of destroying the natural beach and impairing other public trust interests. This administrative approach was not inevitable—indeed may be unlawful—and it has created strong (if unreasonable) expectations on the part of shoreland property owners, heightening the likelihood of litigation.

The Michigan courts have resolved a number of key questions regarding coastal shorelands, but there is no caselaw addressing directly the lawfulness of shoreline armoring. We conclude the courts are not likely to find that the State lacks authority to regulate, or prohibit altogether, shoreline armoring for the purpose of protecting coastal resources. There is caselaw, however, in support of Michigan courts finding either that the current regulatory regime provides adequate protection of coastal resources, or alternatively that it is deficient. Similarly, the courts are not likely to find that reinvigorated regulatory efforts to prevent the destruction and impairment of public trust coastal resources from armoring—even those resulting in the accelerated loss of private properties—violate constitutional protections, especially if State reforms are undertaken with deliberation and care.

If the courts conclude that current regulatory efforts are lawful and require no greater protection, then Michigan will likely see much of its Great Lakes shorelines armored and its natural coastal beaches destroyed. If they conclude that current regulatory efforts are deficient (or if they approve of reinvigorated protection efforts), however, then private shoreland properties may be lost to the lakes—losses that cannot be avoided forever but that might occur sooner than later absent attempts to arrest shoreline erosion. As with most wicked policy dilemmas, the best response may not be at either extreme—that is, always armor or always withdraw—but somewhere in between. Crafting that hybrid approach, and the appropriate rules for applying it, will be the most challenging course to navigate.

This paper, forthcoming in the Michigan Journal of Environmental & Administrative Law, provides a comprehensive review of natural shoreline dynamics along Michigan's Great Lakes shores and a comprehensive review of existing doctrinal, constitutional, statutory, and administrative authorities under which the State and its local units of government regulate Great Lake shoreline armoring. It then identifies claims likely to be made given growing pressures to armor and—potentially—enhanced natural shoreline protection efforts the State might undertake in response, and it contemplates the potential adjudication of those claims. The presentation for this conference will focus on several key ambiguities in current Michigan law and novel analyses of those issues.

Take Out the Trash When You Leave: Cleaning Up Properties Abandoned to Rising Seas

• Thomas Ruppert, Legal Specialist & Coastal Planning Specialist, Florida Sea Grant

This presentation presents the problem of residential properties being abandoned to rising seas and how we can proactively approach this problem through planning for the costs of cleaning up properties before the properties are abandoned. The presentation draws from the book chapter "Take Out the Trash When You Leave: Cleaning Up Properties Abandoned to Rising Seas" by the presenter.

Rising seas exacerbate erosion cause more flooding in low-lying areas along our coasts. We already see increasing numbers of destroyed homes along our coasts, particularly in North Carolina and Florida, washing into the water and covering our beaches with their detritus. While these current losses are due to erosion, which is worsened by but not solely caused by sea-level rise (SLR), on-going SLR will flood more and more properties that neighborhoods. The environmental impacts of leaving abandoned homes to fall onto our beaches or leave them in newly developing wetlands is catastrophic, including the social ills and health hazards of numerous abandoned properties, as the experiences of Detroit and other "Rust Belt" cities can testify. Yet the cost to cleanup properties before this happens is immense. This presentation will discuss these issues and why current approaches remain insufficient. The presentation then discusses the crucial issues of who should pay for cleanups and why, including social equity concerns. From a common sense standpoint, those that cause the need for the cleanups should pay. The presentation examines the difficulties behind such an approach and its limitations. It then concludes that the need to avoid still further subsidies to properties in hazardous areas at risk of loss to rising seas should be addressed by internalizing the costs of cleanup to the properties themselves as this sends appropriate market signals and information about the hazards of rising seas to current and potential property owners.

The presentation will then examine why current mechanisms are insufficient to ensure that the costs of cleanups are internalized to abandoned properties rather than being paid by taxpayers. Next, the presentation evaluates various potential legal and financial mechanisms by which this could be accomplished. After a thorough evaluation, the presentation will focus on special assessments as the most apt tool in our toolbox for developing a comprehensive, community-based program for cleaning up abandoned properties. Even as the most appropriate potential tool, special assessments present weaknesses; these are addressed through recommendations for potential reform.

Finally, the presentation will conclude with an overview of key issues to address in developing a local-government-based cleanup financing program, along with a list of challenging issues that will need further work to address.

Managed Retreat through the Regional Transfer of Development Rights: A Theoretical Case Study of North Carolina

• Kirsten Kinzer, Associate Professor, University of North Carolina Wilmington

This paper explores the possibility of a regional or state-wide transfer of development rights program (TDR) as a tool to manage retreat from flood-prone areas. Local governments have used transfer of development rights programs for decades to preserve farmland and open space in rural areas and to protect historic buildings by transferring air rights in urban areas. This tool has rarely been used to shift development away from sites at risk of flooding or to de-develop areas where housing has been constructed in flood zones. The paper compares several regional TDR programs in the United States to draw lessons learned that are then applied to a theoretical case study of a regional TDR program in the state of North Carolina. The objective of the proposed regional TDR program is to manage retreat from flood-prone sites along the state's Atlantic Coast as well as the Neuse and Cape Fear Rivers.

A transfer of development rights program allows landowners to remove development rights from a "sending site," such as a farm or the air rights above a historic structure, and transfer these rights to a "receiving site" where new development will take place. These transactions are in some cases between two private land owners and in other cases managed by a TDR bank where development rights can be purchased and sold at different points in time. A notable element of the TDR is its ability to generate private funding for land conservation through the use of the development credits by private developers. Developers in "sending zones" are required to purchase TDRs to build or are incentivized through density bonuses granted in return for the purchase of development rights.

In the United States, transfer of development rights systems often span the boundaries of a single local government but examples of regional systems do exist and form a precedent for managed retreat that spans more than one local government. The paper reviews regional TDR systems in King County, Washington and Boulder County, Colorado both of which involve multiple local governments linked through interlocal agreements. The paper also reviews two TDR programs that are managed by a regional government agency: the Tahoe Regional Planning Agency and the New Jersey Pinelands Commission.

The paper identifies several benefits to managed retreat through a TDR program including the creation of a market-based funding source and the potential for the program to be structured as optional or mandatory for existing home owners without triggering a takings issue. For homeowners, a TDR program would create an alternative to the current buy-out system in which property owners often experience multiple floods before qualifying for a buy-out. The paper also identifies several challenges to a TDR program that homeowners opt into. For example, the need to continue public services to holdouts and the negative impact on the local tax base if development rights are transferred to another jurisdiction. A regional TDR program also does little to overcome the psychological challenges of leaving a home and community where a homeowner has strong ties. While a

regional TDR program is not a silver bullet, the paper concludes that it could address several of the outstanding issues with managed retreat perhaps most importantly the lack of government dollars to cover the anticipated need to de-develop flood zones in coming decades.

📢 Speakers



Karen O'Neill

Associate Professor Rutgers University



Ju-Ching Huang

Maryland Sea Grant Legal and Policy Fellow & SJD Candidate at Georgetown Law Center Maryland Sea grant & Georgetown Law Center



Richard Norton

Professor of Urban and Regional Planning University of Michigan



Thomas Ruppert

Legal Specialist & Coastal Planning Specialist Florida Sea Grant



Kirsten Kinzer

Associate Professor UNC Wilmington

5C) Resilient, Equitable, and Sustainable Infrastructure for Coastal Communities: Challenges and Opportunities

🕑 10:30 AM - 12:00 PM, Jun 21

This session welcomes/ encourages work that considers equity implications of climate impacts and adaptations on access to infrastructure and essential services. Both access to infrastructure and resilience of infrastructure to climate impacts are not evenly distributed. Any work to improve infrastructure resilience in coastal communities must consider social equity explicitly or risk exacerbating existing socioeconomic inequality or placing disproportionate burdens on marginalized groups. Equity and justice are critical aspects of this session.

Session chairs: Kelsea Best, Postdoctoral Researcher, University of Maryland; Qian He, Postdoctoral Researcher, University of Maryland Civil and Environmental Engineering; Deb Niemeier, Clark Distinguished Chair Professor, Director of Center for Disaster Resilience, University of Maryland; Allison Reilly, Assistant Professor, University of Maryland Civil and Environmental Engineering

Climate change and housing justice: implications for equitable adaptation

• Kelsea Best, Postdoctoral Researcher, University of Maryland

The negative effects of global climate change are already being felt by communities around the world, with the most serious burdens placed on vulnerable populations. One way that climate change is expected to continue to disrupt community well-being and potentially exacerbate inequality is through disruptions to housing availability and affordability. In this talk, we provide a review of the state of the research on the topic of "climate gentrification", which posits that both climate change effects and adaptation measures may contribute to differences in property values. Importantly, these changes in property values may then reinforce pathways of economic, physical, and social displacement and marginalization of vulnerable residents. Especially in some coastal areas, evidence suggests that property values are already reflecting climate exposure, which has serious implications for housing justice, community demographics, and residential displacement. We also discuss other ways that climate change may interact with access to stable, affordable, and safe housing including post-disaster evictions and the unique vulnerability of renters. Through these examples, this talk broadly explores the question, "Who gets to live where in a climate-impacted world?" with a focus on the implications of this question for equitable adaptation planning. We provide several key areas for future research to continue to explore connections between climate change and housing justice including community-based and participatory methods, longitudinal studies, and research that operates across disciplines as well as temporal and spatial scales.

Using Travel-time to Essential Services to Identify Vulnerable and Fragile Communities

• Utkuhan Genc, Purdue University

Tropical cyclones (hurricanes) and associated coastal flooding are the costliest and deadliest natural hazards in the United States between 1980 and 2021. While the direct impacts are devastating to communities, the indirect impacts of these hurricanes on people's lives can be just as harmful in the long term. The out-migration due to

severe storm and flood events from rural communities can result in reduced mobility and accessibility to services which creates a fragile situation. For example, the geographically largest parish of Louisiana, Cameron Parish, has faced a steady population decline for decades, with additional challenges after hurricanes Laura and Delta in 2020 caused many businesses to shut down operations temporarily or, in some cases, permanently. Nonetheless, over 70% of the 2019 population is still residing in the parish and relies on these businesses or services to provide daily necessities such as food or gas. As the population declines over time, there will be fewer incentives for these businesses to stay in operation, which creates a fragile and uninhabitable situation for the remaining community members. In this study, we looked at travel-time changes under what-if scenarios representing closures of essential services such as grocery stores, gas stations, or medical emergency services. We measure the distribution of drive time differences in the parish population before and after the closest facility to each individual shuts down; this measure relates to resilience, as it indicates the degree to which residents would have access to alternative options for meeting essential needs. In addition to the distribution of marginal travel times, the number of alternatives in the present-day scenario within 30 minutes can also indicate resilience or fragility to closures. The multi-scale analysis ensures vulnerable communities within a region are identified and necessary policy actions can be taken regarding the vulnerability of the population. We used OpenStreetMap (OSM) and open-source python packages to build our algorithm and framework for analysis, with the purpose that similar studies can be carried out in different geographic regions.

The main empirical results of this study will be based on Cameron Parish, where first-hand observations and interviews with residents implied that the population decline-induced business closures are threatening the quality of life of community members. Additionally, a similar analysis will be done on Morgan City and Slidell, Louisiana, communities experiencing different migration trends. Quantifying a measure of vulnerability based on alternatives and marginal time will help us understand how "fragile" the community's long-term well-being is. Preliminary analysis has shown that Cameron Parish is quite fragile with respect to access to grocery stores, where even one store closure would substantially increase the percentage of the population that has to drive over 30 minutes to access groceries. The expected results from this study are an open-source method for analyzing drive time, a generalized approach to quantify fragility, and empirical results from Cameron Parish, Morgan City, and Slidell.

Robustness of Flood Protection Project Evaluation to Alternative Benefit Metrics

• David Johnson, Purdue University

A common criticism of traditional benefit-cost analysis (BCA) is that benefit-cost ratios (BCRs) are reductive in the sense that they aggregate all benefits and costs into a scalar value; decision rules that aim to maximize BCRs ignore distributional impacts in favor of pure economic efficiency. In the context of flood risk management, all else equal, benefit-cost analysis favors protection of affluent communities comprised of assets with higher replacement costs. Allocations of scarce resources for flood protection based on BCA could therefore lead to inequitable provisions of risk reduction; in particular, if buyouts/relocation programs target communities where they are more cost effective, this could leave behind households without the means to protect or insure themselves.

Using risk reduction and cost estimates of nonstructural flood protection projects under consideration by Louisiana's Coastal Master Plan (e.g., elevation-in-place or voluntary acquisitions), we analyze ranked preferences for the projects using different measures of economic risk. In addition to BCRs, we also estimate cost effectiveness measures such as the reduction, per dollar of project cost, in the expected number of residential structures inundated over the planning horizon. Measures like this intentionally ignore the replacement costs or value of structural assets, implicitly valuing protection of each household equally regardless of wealth. In other words, this alternative metric is better aligned with measuring threats to the function of assets rather than to their monetary value. We will then overlay census data to estimate the risk reduction which would be afforded across different demographic categories by project portfolios of varying budgets.

We find that the choice of metric can have a major impact on the rank-ordered preferences for flood risk mitigation options. Once a realistic funding stream is applied to select a portfolio of projects to implement over time, it is less clear whether the choice of metric leads generally to substantially different distributions of risk reduction across racial and socioeconomic groups. However, analyzing the Pareto frontier of nondominated portfolios reveals that dramatic increases in equity can be obtained by placing only a small weight on metrics that are wealth-agnostic.

In our experience, decision makers often want to incorporate equity and social vulnerability considerations into their planning processes, but they either do not know how or worry about blowback if plans appear to explicitly favor one group over another. By incorporating alternative risk metrics into a cost effectiveness analysis of flood protection projects, our results indicate that more equitable outcomes can be achieved (i) without explicitly optimizing for it and (ii) with minimal loss in economic efficiency.

How do Presidential Declared Disasters and Federal Aid Programs affect Renter Eviction Risks? Longitudinal Evidence from the United States

• Qian He, Postdoctoral Researcher, University of Maryland Civil and Environmental Engineering

Global climate change has intensified the frequency and severity of natural hazards in recent decades. Disasters can disrupt many aspects of life in affected communities, especially housing, with implications for recovery and residential displacement. People of renter status could experience social vulnerabilities that may be exacerbated by the occurrence of and reactions to disasters. Furthermore, renters have less access to government aid programs after a disaster or during the federal buy-out programs within high-exposure areas. Eviction orders and the threats of eviction can be devastating to renters in addition to other social-economic burdens. Studies have shown that

evictions are closely connected to poverty, homelessness, joblessness, and mental health issues. At the same time, evidence is scarce on how renters' eviction risk could interact with natural hazards and the potential impact of federal aid programs in the United States. Through constructing a panel dataset (2009- 2018) that combines eviction (orders and threats), Presidential Disaster Declarations, FEMA assistance, and social-demographic data on the county level, this work explores the relationships between disasters, disaster aid, and eviction risks across the U.S. Using a spatial statistical methodology, we examine the following questions: How does the occurrence of a declared disaster influence eviction rates and threats in a county? How does the amount of disaster aid a county receives influence the rates for eviction orders and evictions and contribute to just and equitable disaster aid policies for renters in the U.S.

Infrastructure reliability and the burden of sea-level rise: Do current planning metrics capture the correct risk?

• Allison Reilly, Assistant Professor, University of Maryland Civil and Environmental Engineering

Many rural communities are on the front lines of climate change. The need to understand who may be affected and when is widely acknowledged in order to enable inclusive and cost-effective adaptation planning. Presently, planning resources generally focus on housing impacts; when will a house or neighborhood be inundated and which adaptation strategies are useful to improve the homeowner's fate? Housing, though, is but one of many types of reliable infrastructure needed to enable habitation of a parcel. Other required infrastructure includes reliable road access and ability to treat wastewater. In this work, we explore the potential threat of sea-level rise on non-housing infrastructure (e.g., roads, septic systems) in rural, coastal areas to help inform the impact of their loss on local communities. I will present work that evaluates local accessibility loss during high-tides for the entire US coastline (termed "risk of isolation") for various climate change scenarios, and also preliminary evidence from research that suggests that the risk of septic system failures are quite significant in many coastal communities. The onset of these risks is anticipated often decades prior to when household inundation is expected, suggesting that climate migration may begin much sooner in some areas that is currently expected.

This work has significant environmental justice implications. First, we find that communities of color are more likely to be at risk of isolation from sea-level rise than whiter communities. This higher risk is derived from a combination of higher exposure and fewer investments in roadway infrastructure. Without targeted transportation investments to maintain connectivity, these communities may be more vulnerable to job loss, chronic school absenteeism, and substandard access to emergency services. Second, communities during periods of sewer expansion. The problems associated with this linger today in how we finance and repair infrastructure; sewer systems are often eligible for federal and state funds for maintenance and repair, while septic systems owner are typically responsible for their own repairs. Failure to make repairs can have public health consequences, and even provoke housing evictions. This myriad of factors combined suggest that communities of color will experience a greater burden from sea-level rise than whiter communities, that this burden may transpire in ways in which we are not planning, and much sooner than is currently expected.

📢 Speakers



Kelsea Best





Utkuhan Genc

Ph.D. Student Purdue University



David Johnson

Assistant Professor, Industrial Engineering & Political Science Purdue University



Qian He Postdoctoral Research Associate University of Maryland, College Park



Allison Reilly

Assistant Professor University of Maryland

5D) Equity and Environmental Justice in Urban Environments (2) 10:30 AM - 12:00 PM, Jun 21

Variations in equity prioritization when designing flood-resilient, urban housing policy for climate

adaptation governance

- Melissa Tier, PhD candidate, Princeton University (presenting)
- Elke Weber, Professor of Psychology & Public Affairs, Princeton University

The need for ex-ante climate adaptation policy design is ever increasing in urgency as climate-related disasters continue to increase in frequency and severity, with diminishing hope of mitigating global emissions sufficiently to reduce catastrophic harm – especially for those most vulnerable. However, policy preferences for climate adaptation strategies remain woefully understudied. Furthermore, meeting robust environmental justice and equity standards will require innovative practices and foresight, but little is known regarding how such standards influence preferences for or against multifaceted climate policies. One climate adaptation strategy ripe for such consideration is urban housing resilience in preparation for and recovery from floods. These strategies are often complex and controversial (e.g., choices between protection, retreat, and relocation), and can also be structured in a variety of ways with regard to equity prioritization (e.g., degrees of distributive, procedural, and restorative justice). This study utilizes both quantitative and qualitative data from four urban locations (New York City, U.S.; Seoul, South Korea; Vienna, Austria; and Philadelphia, U.S.) in order to improve understanding of how equity and environmental justice in flood-resilient housing policies are conceptualized differently across distinct urban locations, as well as among residents versus policymakers.

First, we assess quantitatively, via a conjoint survey, how flood-resilient housing policy preferences differ by equity prioritization among residents from the four urban locations. Conjoint surveys are a type of stated preference method in which "respondent[s] evaluate each product or situation" and then "the utilities are estimated, decomposed, from the answers of the respondents" (Alriksson & Öberg, 2008: p. 245).* Originating as a product development tool, conjoint surveys have increasingly been used in policy design settings. Second, we assess qualitatively, via interviews, how flood-resilient housing policy preferences differ by equity prioritization among policymakers from the same locations. Finally, we compare the quantitative and qualitative results to assess whether there are any clear equity-related trends when comparing flood-resilient housing policy preferences among residents vs. policymakers in all of the studied locations.

Data will be analyzed during Spring 2023; we expect to find that flood-resilient housing policy preferences differ significantly by degree of equity prioritization among residents from cities in the U.S., Austria, and South Korea. We furthermore expect the average results of residents across countries to differ more than results within a country (e.g., NYC & Philadelphia). However, we also expect that the dominant conceptualizations of equity concerns within each country (e.g., class-based, race-based, etc.) will result in within-country variation along the lines of those key demographic categories. Finally, while flood policies have significant variation across the 3 studied countries, we nevertheless expect to find more similarity in results among policymakers across all locations than in results among residents. This is because of higher climate and flood policy literacy among policymakers, as well as elite policy learning that may occur between these cities (e.g., Philadelphia officials learning from NYC officials; U.S. & Korean officials learning from Vienna officials).

*Alriksson, S., & Öberg, T. (2008). Conjoint analysis for environmental evaluation. Environmental Science and Pollution Research, 15(3), 244-257.

Governing Transformation: Identifying and Combating Power in Managed Retreat

• Tyler Cooper-Kolb, Master's student, Oregon State University

Despite recent progress to curb global CO2 emissions and direct our global society towards less extreme emission scenario pathways, significant changes to coastal areas across the world have already occurred and are expected to persist due to thermal expansion of seawater and the persistent loss of land-ice, causing sea-levels to transgress landward. For coastal communities facing threats to habitability, the planned and coordinated movement away from risks associated with sea-level rise, or managed retreat, presents itself as a potentially advantageous and transformational adaptation strategy. Yet underlying elements of power condition adaption decision-making processes, and thus govern the transformative potential of managed retreat in any given system. In the following paper, following Brian Massumi's notion of Ontopower, I present a conceptual framework for understanding how operative logics -the underlying elements of power- are present within adaptation processes. I then elaborate on how these operative logics can position managed retreat to be antithetical to transformative adaptation, its supposed objective. Instead, operative logics merely reinforce the social and political structures that already exist, presenting a significant conundrum for social and environmental justice. To conclude this paper, I explore how incorporating insights from decentered deliberative democracy, which privileges the subjective experience of risk from members of the demos and allows for political emergence, can combat operative logics that limit the capacity for social transformation. The capacity for managed retreat to operate as a successful vehicle-of-change for coastal communities depends on its capacity to not only address the physical conditions that shape risk, but also the elements of power that operate within vulnerable communities.

Closing the Gap Between Adaptation Justice in Theory and Practice: Practical Dilemmas from Managed Retreat

• A.R. Siders, Assistant Professor, University of Delaware

Just managed retreat is a widely avowed goal of scholars, practitioners, and community members, yet achieving it in practice remains largely elusive. Managed retreat poses difficult challenges for justice, such as how to resolve trade-offs across values and stakeholders. Justice theories are intended to guide decision-makers in addressing these dilemmas, but most fall short of guiding practitioners or community leaders in their implementation choices. This paper uses a critical analysis of justice theory, in the specific context of property acquisition programs (buyouts) in the United States, to demonstrate the gaps between justice theory and its application to practice. The gaps identified are not unique to managed retreat, though, and nor are the recommended actions to close the gap.

Justice theories in the climate mitigation space are often "focused, in part, on the pragmatic question of their applicability to the current dilemmas of both climate change and the limitations of global governance" (Schlosberg and Collins, 2014, p. 365), but climate adaptation justice conversations have tended to focus on theoretical framings of justice rather than their practical implications. The objective of this paper is to advance a pragmatic consideration of adaptation justice.

The key decision points encountered by an administrator in a buyout program reveal several crucial weaknesses in justice theory. Specifically, justice theories struggle to prioritize distribution of adaptation resources, distribute adaptation efforts that cause both harms and benefits, weigh the trade-offs of uncertain harms and benefits, identify participants, resolve conflicts in participatory processes, or redress historic wrongs. Without guidance from justice theory or adaptation policy on how to resolve these dilemmas, implementation decisions are often shaped by administrators' personal value systems, such as their views on the purpose of adaptation, the role of government, and the importance of place attachment. Decisions are also constrained by limited authority, available resources, and institutional goals, which limits the option space for administrators to achieve just outcomes. Buyouts implementation, then is often uneven. Variation could potentially enable local tailoring, but without transparency into how decisions were made or comparisons across outcomes, it is uncertain whether variation improves tailoring to local contexts or perpetuates uneven and inequitable distribution of resources.

Both academics and practitioners can close the gap between theory and practice, and recommendations for both groups are presented. For academics, these include more nuanced evaluations of adaptation justice, more comparative analyses and consideration of counterfactuals and trade-offs, inclusion of a wider range of disciplinary perspectives, and more specific justice proposals. Proposals that do not address one or more of the practical dilemmas faced by administrators are likely to be too vague and high-level to advance the cause. For practitioners, recommendations to close the justice-theory gap include greater transparency in decision-making processes and criteria, to enable accountability, evaluation, and policy learning; and more holistic approaches to adaptation governance, to address the constraints on adaptation implementation. Achieving greater justice in managed retreat is not likely to be simple, straightforward, or without trade-offs. This does not make it any less critical to pursue.

References:

Schlosberg, D. and Collins, L. B. (2014) 'From environmental to climate justice: Climate change and the discourse of environmental justice', Wiley Interdisciplinary Reviews: Climate Change, 10.1002/wcc.275

Siders (2022) 'The administrator's dilemma: Closing the gap between climate adaptation justice in theory and practice, Environmental Science & Policy, 137: 280-89, 10/1016/j.envsci.2022.08.022

White Communities in Retreat: Climate Change, Privilege, and Adaptation in US Cities

- Kevin Loughran, Assistant Professor of Sociology, Temple University (presenting)
- James R. Elliott, Rice University
- Jay Wang, Rice University

With managed retreat in ascendance, what are its implications for racially segregated urban communities? This paper investigates the residential outcomes of FEMA's Hazard Mitigation Grant Program, a major federal program that provides funds for the buyout of flood-prone homes in the US. Drawing on an original dataset of address-to-address residential history data for approximately 9,500 buyout participants nationwide, we find that moves taken via managed retreat are driven not only by environmental risk, but just as powerfully by the racial composition of origin and destination communities. We find that on average, people who have made residential moves via FEMA's buyout program have reduced their flood risk by 63%. At the same time, these federally funded moves reveal a strong pattern of racial segmentation; nationally, 95.8% of such moves out of predominantly White communities end in predominantly White communities, which is reflective in part of the FEMA program's rural 1980s origins in the Upper Mississippi River watershed. However, when we focus our analysis on metro areas – where FEMA has shifted the program's geographic focus since 2000 – the same result holds. Despite broader, more racially diverse choice sets available in US cities, 94.9% of moves out of predominantly White urban communities also end in predominantly White communities. In contrast to studies that have presaged the emergence of climate gentrification in certain US cities, we argue that under the current mode of managed retreat, the far more common residential move is one that buttresses existing White social and spatial advantages; these are moves to neighborhoods of similar or greater - and not lesser - racial privilege. We argue that new interdisciplinary scholarship focused on urban adaptation and managed retreat should attend more closely to this predominant pattern and the political and policy implications that follow from the federally-funded shoring up of White communities in the face of environmental threats. We discuss what this pattern of racialized environmental mobility implies for urban adaptation and managed retreat more generally.

Green infrastructure solutions to support flood mitigation and adaptation in coastal low-lying disadvantaged communities

- Narcisa Pricope, Professor, University of North Carolina Wilmington (presenting)
- Leah Mayo, Interim Assistant Dean for Community Engagement and Health Equity, University of North Carolina Wilmington
- Joanne Halls, Professor, University of North Carolina Wilmington
- Crystal Dixon, Assistant Professor of the Practice, Health and Exercise Science and Racial Equity Consultant, Wake Forest University

Coastal environments are essential ecosystems that play vital ecological roles and supply a wide array of

ecosystem services, including flood control, especially in low-lying regions at the land-water interface. Coastal communities frequently impacted by natural hazards can face extensive and recurrent flood inundation and subsequent infrastructure damage with immediate and long-term detrimental effects on disadvantaged communities. Effective and adaptive coastal resiliency planning is becoming more necessary as the frequency and intensity of storms increase and coastal populations expand. Furthermore, climate change has disproportionate impacts on underserved and disadvantaged communities, with serious implications for equity and environmental justice. In this co-designed project, we will develop a green infrastructure suitability model in consultation with community groups to prioritize areas of implementation of nature-based solutions (NbSs) in a highly urbanized tidally influenced coastal county of the US Atlantic Coastal Plain region that is home to multiple disadvantaged communities at recurrent risk from flooding. With funding from a NASA EEJ award and building on results from a regional NOAA Sea Grant award, our project is developing a replicable methodology that establishes the evidence base for the effectiveness of NbSs in flood-vulnerable coastal watersheds and determines the feasibility of incorporating cutting-edge community engagement techniques into NbS implementation prioritization. We have three main objectives (third objective is work in progress during summer 2023): 1. Develop a cloudcomputed, replicable remote sensing and GIS-based green infrastructure suitability index (GISI) methodology at the local scale in New Hanover County, North Carolina as a function of exposure to recurrent inundation and projected sea level rise and accounting for vegetation type and condition from time-series of remote sensing data. 2. Develop an environmental justice vulnerability index (at the block group level) using community-identified dimensions of environmental justice (EJ) with relevance to coastal planning for climate change (primarily flood mitigation) and adaptation measures, as well as an analysis of chronic Analyze the green infrastructure suitability index against it to identify areas of overlap between suitability for green infrastructure solutions and EJ communities that would most benefit from their implementation. 3. Use community engagement techniques (charrettes, surveys, focus groups, and/or community workshops) to elicit community input and feedback along four prioritization categories both during the development of the GISI and at the conclusion of the modeling efforts in order to prioritize solutions and produce implementation suggestions while engaging in community education on climate change impacts on EJ neighborhoods and green infrastructure as an adaptation strategy. The outcomes of this project include a community feasibility study proposing a reproducible and transferable methodology for identifying suitable NbS locations as a function of location, exposure to risk, socio-demographic makeup of the area and satellite remote sensing data on the one hand and, on the other, the perceptions, feedback and input of potentially targeted communities in terms of prioritization and education around possible implementation solutions. Green infrastructure/nature-based solutions enhance urban sustainability and address EJ issues through improving environmental conditions and human well-being, thus making urbanized areas more attractive and livable; restore degraded ecosystems and improve the resilience of ecosystems, especially wetlands and tidal marshes that deliver critical ecosystem services in low-lying areas; contribute to improved risk management and resilience planning by synergistically reducing multiple risks than grey infrastructure alone; and contribute to developing climate change adaptation and mitigation strategies that can be implemented in at risk EJ communities in coastal regions.

Visualizing Relocation on a Spatial Spectrum: A Tool for Organizing Refuge alongside Community

· Laura Durgerian, Senior Associate Landscape Architect & Urban Designer, Mithun

As built environment practitioners, Mithun investigates how relocation processes can strengthen place attachments and build collective capacity to address ongoing climate shocks and stresses. Conceptual illustrations of the varied forms managed retreat could take across land ownership and spatial scales – within a single parcel, incrementally across a block, or at a community scale – allow community collectives to consider how climate adaptation and relocation intersects with their wider constellation of values and needs. Using these visualizations as prompts, coalitions of community-based organizations and designers can together define a contextually nuanced vision for sending and receiving sites that responds to local hazards, place-based identities, access to jobs and social capital, resilient shared infrastructure, and other community priorities. After presenting these spatial concepts, this session will discuss the Sea2City Design Challenge in Vancouver, B.C. as an example translation from concept to multi-phased site-specific vision that overlays multiple stakeholder prioritizes, including: commitment to decolonizing the design process, protection of sending site housing stock within its lifespan, restoration of pre-colonial shoreline habitat, co-stewardship of sending sites with First Nations, and alignment with city-wide planning efforts.

Speakers



Melissa Tier PhD Candidate Princeton University



Tyler Cooper-Kolb

Master's Student Oregon State University



A.R. Siders Director, Climate Change Science & Policy Hub University of Delaware



Kevin Loughran Assistant Professor of Sociology Temple University



Narcisa Pricope Professor University of North Carolina Wilmington



Laura Durgerian

Senior Associate Landscape Architect & Urban Designer Mithun

12:00 PM

6) Climatopia: Envisioning Radical Designs for the Climate Crisis © 12:00 PM - 1:30 PM, Jun 21

€ Speaker

Auditorium



1:30 PM

7A) Buyouts and Property Acquisition

② 1:30 PM - 3:00 PM, Jun 21

Means-Testing Buyouts in Climate Retreat

• Stephanie Stern, Professor, University of Arizona

As climate change causes unprecedented dislocation from flooding and sea-level rise, a new legal regime for climate retreat (i.e., shifting human settlement from severe climate risk zones) is developing. Buyout laws, such as FEMA's Hazard Mitigation Grant Program, fund government acquisitions of severely flood-impacted homes, enabling owners to relocate, and require localities to rezone acquired land as open space. Despite the growing interest in flood buyouts as a tool for climate change adaptation, there has been limited attention to the capacity of buyouts to incentivize "buy ins" to flood zones by subsidizing flood risk-taking—a problematic irony given buyouts' increasing role in climate retreat. In this presentation, I employ the law and economics theory of transition relief to reconceptualize buyouts from their current focus on dispossession to a form of climate transition relief that balances incentive effects against individual losses. Specifically, I advocate for a presumption against buyouts for flooded homeowners in order to curb incentives for high-risk housing choices. However, I carve out a significant exception for low-income residents of floodplains and proposes means-testing buyouts. In the face of severely constrained housing choice, unaffordable flood insurance, and high marginal costs from property loss, this group is less vulnerable to incentive distortion from compensation and more vulnerable to harm from dislocation.

Racial Dynamics of Federal Property Buyouts in Flood-Prone Areas

• Kay Jowers, Director, Duke University & Nicholas Institute for Energy, Environment & Sustainability (presenting)

- Lala Ma, Associate Professor, University of Kentucky Department of Economics
- Christopher D. Timmins, Professor, Duke University Department of Economics

Recent climate projections forecast significant increases in flood risks, and the greatest increases are anticipated to be in communities of color. The use of managed retreats, or "buyouts," of flood-prone properties as an adaptation response is also likely to grow. This paper investigates the equity implications of managed retreat by analyzing the role of race and ethnicity in buyout bargaining outcomes and how those outcomes affect longer-run neighborhood change. To do this, we combine nationwide administrative data on federal property acquisitions and housing sales transactions with a database tracking individual movement over time. We then estimate the discount in buyout payments relative to a property's fair market value, how the payment received affects where households relocate, and whether these impacts differ by race. We find that the buyout compensation received by families of color is around 8-10 percent lower than that received by white families. Moreover, these price discounts detract from individual wealth and the quality of the neighborhood to which families relocate. Our work highlights how government policy, aimed to address increasing climate impacts, may exacerbate the burden of climate change on vulnerable communities.

Resilience through property buyouts: Are buyouts effective in reducing a community's vulnerability to floods?

- Waqas Ahmed Raza, PhD Student, School of Urban Planning, McGill University (presenting)
- Lisa Bornstein, Associate Professor, McGill University

Governments worldwide are adopting property buyout programs to protect residents from flood risks. In response to the 2017 and 2019 floods, the Quebec government obliged certain households to demolish their homes, offering buyouts in compensation. In New Brunswick and Vermont, similar policies entailed voluntary household participation. However, preliminary research suggests that buyouts may not contribute to long-term resilience. They are highly disruptive to dislocated households; entail challenging implementation for municipal authorities, and prompt inequitable real estate dynamics that may undermine the municipal capacity to deliver services. Are buyouts an effective risk-reduction policy instrument? How could such programs be improved? In responding, this research investigates how mandatory (QC) and voluntary (NB and Vermont) buyout policies compare in their effects on the socio-economic vulnerabilities of households (a) participating in buyouts and (b) remaining in situ. Second, the research documents how property values, and associated tax revenues, have changed. Third, the research explores the challenges municipalities face in implementing buyouts and maintaining services. Study areas, with a number of dislocated households, are: Rigaud (QC), nearly 100 houses; the Lower Saint John River region (NB), 80 properties; and the TRORC region in Vermont, 154 properties. Data from policy reviews, property transfers, household surveys, and interviews with residents, local officials and retreat experts will be analyzed at the individual, household, and community levels. Results will provide insight into how different buyout approaches target specific vulnerabilities and with what effect. The research will contribute to evidencebased policies regarding buyouts for better flood risk management and resilience enhancement in Quebec and elsewhere.

Living with the Land Left Behind: Sending Communities and Acquired Coastal Properties

• Annika Tomson, NOAA Digital Coast Fellow, Coastal States Organization

Sea level rise, intensifying precipitation patterns, increasing Great Lakes lake level change variability, and higher erosion rates threaten coastal properties and infrastructure across the United States. In cases where climate impacts make certain shoreline structures and lots uninhabitable due to inundation or erosion, these properties may transition from private to public ownership via a number of legal or constructive methods, such as buyout programs, abandonment, or simply permanent conversion to public submerged land. Because many of the legal and practical responsibilities around land management fall to local governments, coastal communities are often responsible for dealing with the on-the-ground impacts of inundated and eroded property. With climate change placing an increasing number of homes and properties at risk each decade, more communities and local governments – particularly those that are rural, small, isolated, racially minoritized, or low-income – will be faced with managing a critical subset of vacated coastal properties.

The Coastal States Organization and Association of State Floodplain Management have undertaken a partnership project through the NOAA Digital Coast Fellowship to assess and improve the technical guidance resources available to local communities to understand, plan for, and manage this subset of acquired or vacated properties on the changing coast. This presentation will explore the experiences of sending communities' management of acquired previously private coastal property, and the role that the land left behind plays in their broader community. Initial findings will be presented from a series of local practitioner interviews and an assessment of existing resources available to support the management of acquired previously private coastal property. Trends and opportunities will be explored, toward the development of new guidance products in 2024.

Vacated coastal properties present a variety of challenges to the sending communities responsible for managing them. Local governments are constrained by limited technical, financial, and staff capacity, unclear authorities, and the controversial nature of managed retreat. Managing eroded or inundated land may necessitate the removal of structures, utilities, and roads as well as remediation of hazardous materials and debris. Acquired property also requires ongoing maintenance and may incur other project costs. At the same time, communities face lost property taxes when private coastal property transitions to publicly owned, resulting in decreased revenue. Neighborhoods face potential fragmentation from both physical checkerboarding of property to public land can alienate former residents if they feel their connection to the land has been terminated. Structural inequities in

acquisition programs can favor wealthy individuals and whiter communities; in turn the benefits of the vacated land can be similarly concentrated.

Nevertheless, sending communities live with the land that is left behind as people relocate. If effectively managed, the land can support the habitability of the broader community, physically through flood protection and erosion control and socially through public access and use. Whether left alone or transformed, the land is a part of the community, and thus poses an opportunity for self-determination and agency in the kind of future sending communities want for themselves. This presentation dives into the experiences of sending communities as they steward acquired coastal properties and work towards building that future.

Louisiana Buyouts and Resettlement Programs

- Pat Forbes, Executive Director, Louisiana Office of Community Development (presenting)
- Sandra Gunner, Manager, Louisiana Office of Community Development

The State of Louisiana's Buyout and Resettlement Programs are voluntary programs that provides property buyouts in flood-prone areas, as part of the Louisiana's efforts to reduce flood risk throughout the state. The buyout program, which is designed to primarily benefit low- to moderate-income residents, offers an incentive—payment above fair market value—to eligible applicants who relocate to areas of lower flood risk. Our presentation will review the work that the program has accomplished to date along with highlighting the relationship established between the Louisiana Office of Community Development and Local Governments.

Speakers



Stephanie Stern Professor University of Arizona



Kay Jowers Director Duke University & Nicholas Institute for Energy, Environment & Sustainability



Waqas Ahmed Raza

PhD Student McGill University



Annika Tomson

NOAA Digital Coast Fellow Coastal States Organization



Pat Forbes Executive Director

Louisiana Office of Community Development

7B) Advancing Institutional Capacity to Reduce Social, Environmental, and Economic Vulnerability in Climate Migrant Receiving Communities (panel) © 1:30 PM - 3:00 PM, Jun 21

Millions of people are expected to be displaced by climate change in the United States by the end of this century, yet little is known about community capacity to effectively receive and support them, or their ability to do so over time as the effects of climate change advance. Some people will adapt in place, but many will move. Where will they go and how can this movement of people result in positive outcomes for both those who move and the communities that receive them?

To support climate migration governance, policy, and planning, this panel session will present findings from research teams at Louisiana State University and the Urban Institute that have led studies examining community impacts, capacity, and responses to climate migration across the U.S. Gulf Coast region. Panelists will first introduce their studies and the community contexts in which they led their research, and a moderated discussion will follow to discuss opportunities to advance institutional and community capacity to reduce social, environmental and economic vulnerability in climate migrant receiving communities in the U.S. Gulf Coast region and across the country.

Topics to be discussed include: adaptive migration and equitable relocation; nonstructural opportunities for hazard mitigation and adaptation; planning for institutional resilience in receiving communities; trends in federal disaster and climate migration investments; strategies to reduce social, environmental, and economic risks in receiving communities; and recommendations for identifying potential future receiving communities and resilience planning.

Session Chairs: Haley Blakeman, FASLA, PLA, Associate Director and Assistant Professor of Landscape Architecture, LSU; Anne Junod, Senior Research Associate, The Urban Institute

Panelists:

- Traci Birch, LSU
- Haley Blakeman, LSU
- Anne Junod, Urban Institute
- Dan Teles, Urban Institute
- Breno Braga, Urban Institute

€ Speakers

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Traci Birch

Assistant Professor and Managing Director of Coastal Sustainability Studio LSU School of Architecture



Haley Blakeman

Associate Director, Assistant Professor LSU Robert Reich School of Landscape Architecture



Anne Junod

Senior Research Associate Urban Institute



Dan Teles

Senior Research Associate Urban Institute



Breno Braga

Principal Research Associate Urban Institute

7C) An Early Career Panel on the Limits and Reforms of Insurance under Shifting Climate Risk (panel)

I:30 PM - 3:00 PM, Jun 21

Around the world, frequent extreme events like floods, storms, wildfires, and drought are placing strain on the types of risks that insurance schemes are able and willing to protect against. In the United States, public programs like the National Flood Insurance Program (NFIP) and private companies providing homeowner's insurance face bankruptcies and bailouts after major events whose frequency and severity have not been adequately baked into formal and informal expectations of risk by industry and the public at large. This has led to premiums that don't reflect the actuarial risk of living in specific locations and has enabled development into under-protected and under-insured areas. As a result, the absence of changing climate risk in insurance premiums has positioned public, and some private companies in precarious financial positions and may have long-term effects on the housing market. This is evident in the enormous debt burden of NFIP of 20.5 billion USD (de Ruig et al., 2022) and the exodus of private insurance companies across much of the West Coast and US Gulf Coast following major wildfires and coastal storms that racked up damage claims exceeding the amount in companies' reserves (Bittle, 2022). In the face of current and future climatic risks, the financial solvency of these schemes is difficult to reconcile under the status quo risk modeling, and pricing approaches.

Importantly, not only does this hit public and private (re)insurance companies but also policyholders who face disparities in who can access insurance, what levels of indemnity they receive with respect to actual damages, and to what degree they can afford financial protection in the first place. This burdens households to determine what risks they retain while also facing decisions about staying in place, retrofitting their home to mitigate potential risks, or choosing to relocate altogether.

The interaction of insurance access, actualized risk, affordability, and housing has garnered rising attention, particularly in the United States, following the aftermath of massive events like wildfires in Oregon in 2020 and Hurricane Ian in 2022. Innovative technological and policy responses are needed to ensure that insurance markets are open and effective for policyholders and can withstand large climate shocks. Given how related this issue is to the multi-thematic topic of managed retreat, this issue deserves more concerted attention and proactive ideation. The discussion will focus on insurance's role in housing and real estate and how insurance overlaps with individual-level mitigation or adaptation strategies like voluntary property acquisitions, home elevations or flood retrofits, and community buy-in and leadership on a local scale. We will discuss how technological advancements in risk observation and forecasting are changing how insurance is priced and packaged, including the role of technology in expanding forms of big data to critical public sector use cases around disaster management and insurance implementation. We will also consider how novel practices like parametric insurance can overcome challenges in penetration rates and how they intersect with housing, asking if there's room for the uptake of such programs in the United States. In sum, we aim to spotlight some critical technological and governance interventions that could usher in advanced forms of insurance.

In doing so, we will look at questions such as:

• What actions are insurers and governments taking to promote risk reduction or adaptation practices that reduce residual risk to be subsequently transferred or retained?

• How can this be reconciled with individual perspectives on risk, affordability, and community development and cohesion precisely in underserved frontlines of climate change?

• To what extent does the health of insurance markets reverberate through the broader property market?

• How can new technologies facilitate better and more equitable risk coverage while identifying and addressing critical protection gaps?

• How are AI-enabled methods of assessing risk expanding our understanding of the relationships between housing, risk, and insurance?

Through the panel discussion, we intend for the audience to walk away with greater familiarity with the status quo failings of insurance and the possible opportunities for insurance reforms. Hearing from a multi-disciplinary panel of early career researchers who work across housing-related issues, including relocation, buyouts, and real estate, the audience will deepen their understanding of how managed retreat research and activities interface with the insurance themes raised in the discussion. For such an interdisciplinary conference surrounding the topic of managed retreat, this session will appeal to participants from various disciplines.

Specifically, this panel discussion will feature the work and perspectives of early career researchers. As graduate students and early career scientists convening the panel, we are excited to showcase how our peers engage with this increasingly important topic, including perspectives on the direction of potential insurance reform and new methodologies in this field. References

Bittle, J. (2022, June 24). Louisiana's insurance market is collapsing, just in time for hurricane season. Grist. https://grist.org/housing/louisiana-homeowner-insurance-hurricane-season/

de Ruig, L. T., Haer, T., de Moel, H., Brody, S. D., Botzen, W. J., Czajkowski, J., & Aerts, J. C. (2022). How the USA can benefit from risk-based premiums combined with flood protection. Nature Climate Change, 12(11), 995-998.

Session Chairs: Hannah Friedrich, Ph.D. Student, School of Geography, Development, and Environment, University of Arizona; Alex Saunders, Ph.D. Student, School of Geography, Development, and Environment, University of Arizona; Emmalina Glinskis, Master's Student, University of California Berkeley, City and Regional Planning

Speakers

Jacob Bradt Harvard University

Ian Gray

Centre Alexandre Koyré at the École des Hautes Études en Sciences Sociale (EHESS)



Clay Kerchof California Department of Housing & Community Development



Rachel M. Young PhD Candidate Princeton University

7D) Managed Retreat in Coastal New England

I:30 PM - 3:00 PM, Jun 21

Community Responses to Managed Retreat: Exploring Trade-offs through an Adaptation Alternatives Assessment in Hull, Massachusetts

- Bella Purdy, Climate Resilience Planner, Weston & Sampson
- Joanna Nadeau, Senior Resilience Planner, Weston & Sampson
- Chris Krahforst, Direct of Climate Adaptation, Town of Hull

The Town of Hull Massachusetts is in the process of exploring design alternatives for a climate vulnerable coastal neighborhood referred to as the Hampton Circle Area (HCA). The HCA is a low-lying area surrounded by Boston Harbor water on the eastern and western sides connecting two drumlins and is most vulnerable to sea level rise and storm surge impacts. Residents regularly witness nuisance flooding from high tides. The Town received a Municipal Vulnerability Preparedness grant from the Massachusetts Executive Office of Energy and Environmental Affairs to conduct a planning and design alternatives assessment to help design a roadmap for climate adaptation. One of the options explored in this assessment was planned retreat.

During the session, participants will learn about the town's successes and challenges in identifying planned retreat as a viable, cost-effective adaptation option for the HCA. The session will provide an overview of the multi-layered roadmap that includes near-term, mid-term, and long-term actions. The roadmap includes the following:

1. Redesign of a sea wall on the eastern side of the site that overtops and is eroded at its structural foundation (near-term)

2. Expansion of the Town's home elevation program in partnership with FEMA (near-term)

3. Community engagement and planning related to emergency response procedures (near-term)

4. Conducting a stormwater capacity assessment, updates to the system, and regrading of low-lying roadways (mid-term)

5. Integration of a vegetated, coastal buffer zone on the western side of the site (mid-term)

6. Planned retreat that results in just and equitable outcomes for long-term residents (long-term).

The presentation will conclude with an overview of how the town plans to implement a roadmap in which planned retreat is one of several adaptation strategies, as the next phase of the HCA project.

The HCA is unique because it has a community with many older adults with long-term tenure in the neighborhood whose properties have been passed down through generations. Hull is assessing planned retreat over a multi-decade time horizon, so that residents with deep ties to the neighborhood have adequate time to plan for transformative transitions.

The Town of Hull and Weston & Sampson utilized a variety of community engagement methods such as workshops, surveys, educational videos, focus groups, and an ArcGIS Storymap to support resident participation and acceptance in the emerging roadmap. The town gaged resident interest and willingness to relocate over a multi-decade time horizon, or sooner if desired. It was important that the engagement methods used helped residents understand future vulnerabilities and trade-offs, and that each resident felt heard and supported.

The HCA will act as a case study for participants who may be facing similar challenges in the coastal communities they live in, work in, study, or serve as practitioners. Presenters will facilitate question and answer about effective community outreach strategies when initiating discussions with residents about planned retreat. Adequate time will be given to discussion so that the presenters and participants can discuss these challenges and opportunities and brainstorm ideas for the future of this project.

Reimagining Water-Dependent Educational and Recreational Institutions in Coastal Areas

- Diane Mas, Chief Resilience & Sustainability Officer, Fuss & O'Neill, Inc. (presenting)
- Chris Gasiorek, Sr. Vice President of Operations and Watercraft, Mystic Seaport Museum
- Katherine Kahl, Extension Assistant Professor, Sustainable Fisheries & Coastal Resilience, Gloucester Marine Station, University of Massachusetts Amherst (presenting)
- Sara Morrison, Business Line Manager Climate Resilience, Fuss & O'Neill, Inc.

For organizations whose mission, purpose, and daily function is inextricably linked to the waterfront, retreat is not only relocation of facilities or activities. Managed retreat may necessitate a reconsideration of fundamental functions, which can impact the facilities and programs needed, the resources required, and perceptions by the public and even financial support and sources. For educational institutions, parks and recreational facilities, and other water-dependent, non-residential entities, planning for the future may include hardening measures to keep the water out, reimagining and reinventing spaces and programs to let water in, or reconsidering the size and scale of facilities and programs under future conditions. This presentation explores the unique challenges, as well as potential opportunities, that coastal, water-dependent institutions face. While being located in a coastal area has necessarily meant dealing with coastal hazards from storm surge to algal blooms, projected climate change will bring a combination of shocks and stressors including gradual sea level rise and associated sunny day flooding to increased flooding from coastal storms and increases in the intensity and frequency of storm events. Understanding the potential cascading impacts to a site and its mission and operations will also be critical in planning for a viable future. Preparing for future conditions will require: (a) a clear understanding of future climate projections and subsequent understanding of institution exposure and vulnerability on a relevant planning horizon, (b) consideration of the organization mission, purpose and goals, (c) involvement of key stakeholders including institutional operations and governance, as well as the population(s) served by the institution, and (d) thoughtful alternatives analysis, which includes considering a range of solutions, institutional mission and goals, and balancing costs and benefits, including some which may be difficult to monetize. Using case studies from Mystic Seaport Museum (Mystic, CT) and the University of Massachusetts (UMass) Gloucester Marine Station (Gloucester, MA), and Goddard Memorial State Park (Warwick, RI), this presentation/panel will focus on the experiences of parks/recreational facilities, marine-focused educational institutions, and other non-residential, non-commercial institutions in order to share challenges and also share common best practices, approaches, and opportunities for retreat while maintaining a critical water-dependent focus and function.

Mystic Seaport Museum (MSM), a historic, cultural, and uniquely Connecticut institution, is, unfortunately, vulnerable due to its mission and collection, which demand that it be located in a coastal marine environment. Nestled on the waterfront of the Mystic River, MSM is highly vulnerable to the effects of sea level rise and increased storm events. Flooding, which is occurring at the site with increased frequency, jeopardizes MSM's ability to welcome and educate the more than 250,000 annual visitors on its 49-acre campus that is home to 180+ structures, a coastal seafaring village, historic watercraft, and a catalog of more than two million artifacts. One of only a few remaining Connecticut and New England maritime museums, MSM also serves the academic community as the campus for the Williams-Mystic program and the Munson Institute. According to the Connecticut Institute for Resilience and Climate Adaptation (CIRCA), the Towns of Stonington and Groton should plan for 20" of sea level rise along the banks of the Mystic River Estuary by 2050. As the water level in the Mystic River increases due to sea level rise, even smaller storm surges, with high rates of occurrence, will greatly impact MSM's grounds, its facilities, and its ability to serve the community. In response, the MSM created the MSM Sea Level Rise Strategic Facility Plan, a vision for the future of the Museum. The additional benefit of this project is that these adaptations will be visible to the hundreds of thousands of visitors who will experience them through exhibits and programming.

The UMass Amherst Gloucester Marine Station (GMS) is embarking on an exciting planning process that both addresses immediate infrastructure needs and shapes longer-term research and experiential learning opportunities for students. Located in Hodgkins Cove (Gloucester, MA), the GMS has a long history as a granite quarry (mid-1800s -1927) and a lobster pound (1930s -1963). In 1964, the property was conveyed to the University of Massachusetts Foundation. Since 1970, UMass has conducted a variety of research on seafood nutrition and microbiology, bluefin tuna and sea turtles, sustainable fisheries and other seasonal marine research. The station has reached a turning point with UMass Amherst's decision to make strategic investments in new faculty hires, planning, and infrastructure improvements aimed at bolstering capacity and ensuring the long-term resilience of the station as a hub for hands-on, immersive marine and coastal research, learning, and engagement. Now the University is focusing on addressing issues related to deferred maintenance and more immediate research and teaching needs, while also laying a foundation for longer-term planning at the site that will address the impending challenges presented by rising sea levels and changing climatic conditions through the application of natural and nature-based solutions. Adapting the GMS to future climate impacts will necessitate a reconsideration of fundamental functions. This allows for a reimagining of the facility and programs possible on the site over time, which will impact public perceptions and the financial support and other resources required to maintain the mission of the Station, which will focus on becoming a testbed for innovative coastal climate adaptations through building resiliency approaches that work with natural systems. The case study will showcase how the GMS will be working to create a true living lab with an aim of becoming a hub for catalytic coastal resilience research while incorporating elements of phased retreat.

Goddard Memorial State Park owned and operated by the Rhode Island Department of Environmental Management is located on the coast of Rhode Island. Goddard Park attracts thousands of visitors each year as Rhode Island's most popular Metropolitan Park. It includes numerous recreation facilities including trails, fields, and forested areas, as well as a performing arts center. Recent Master Plan development for the project acknowledged the need to consider climate change impacts on this coastal recreational site. Designing with a 50 to 70 year timeline required consideration of key amenities and features of the Park, ways in which sea level rise, more intense rainfall and higher temperatures would impact both facilities and user experience, and how master planning should response to those changes.

Understanding and Addressing Barriers to Managed Retreat along the Coast of Massachusetts

• Kristin Uiterwyk, Director, Urban Harbors Institute, University of Massachusetts Boston

The concept of managed retreat seems to be gaining interest in Massachusetts, but very few communities are actively implementing managed retreat projects. To better understand the barriers to managed retreat, the Urban Harbors Institute at the University of Massachusetts Boston conducted a survey of municipal staff and managers in November of 2022. More than half of the state's 73 coastal municipalities responded to the survey, providing useful insights into why their communities have or have not considered managed retreat. Among the barriers most commonly identified were a lack of sites for relocation, cost of purchasing land, and concern about public response. Equity concerns were among the least commonly sited barriers to managed retreat. In this presentation, we will dig into the data to identify tools and resources that can help communities advance the concept of managed retreat and discuss areas in need of additional research.

Weighing risk to coastal living: Climate change threats, COVID-19 outbreak, and the housing crisis in Northeastern US

- Kanako Iuchi, Associate Professor, Tohoku University (presenting)
- Donovan Finn, Assistant Professor, Stonybrook University
- John Mutter, Professor, Columbia University

The Boston Metropolitan region has always been susceptible to coastal flooding (Kirshen, Knee, & Ruth, 2008). However, the wakeup call provided by the devastation of New York City from 2012's Hurricane Sandy, actual threats from the sea level rise (up to 20 cm rise with the sea level since the 1950s) (Kaufman, 2021), and sequential 2018 nor'easters have pushed the Boston region to move forward by addressing the climate change issues. The State of Massachusetts, since 2016, mandates that municipalities to develop "vulnerability plan" (Shi & Varuzzo, 2020), and FEMA's 2015 upgraded flood risk maps along the US east coast made coastal communities more aware of risks to coastal living with the possible rise of insurance premiums.

This research targets the small coastal town of Hull (2020 population: 10,475) on the isthmus south of Boston Bay. Hull faces climate threats, hastened sea level rise, and recurrent nor'easters. In 2020, the area had relatively low COVID-19 incidents, with a high vaccination rate. Still, the town was much quieter throughout summer when their population of seasonal residents is usually high. Pre-COVID, the Town had successfully attracted residents from neighboring towns and central Boston to move in, with many describing Hull as the last unspoiled "gem" in the Boston metro area. Two public transit options – commuter boats and trains – in addition to private automobiles make commuting from Hull to downtown Boston relatively smooth. In addition, housing prices, on average, were much more affordable in the region as its somewhat isolated location discouraged people from moving in. Prior to the COVID19 outbreak Hull's population and housing prices were relatively stable with modest increases; however, the area's housing prices increased sharply after.

This exploratory research investigates how coastal residents determine and navigated intertwined risks of climate change, the pandemic, and rising housing costs (including insurance) when choosing a place to live. The research takes a qualitative approach to understand: i) the socio-cultural and housing settings of the town and the region, ii) government policies and programs on different risks, and iii) resident attitudes and actions related to risk and risk mitigation. This paper particularly focuses on the residents' interview results that ask about their residence, lifestyles in the pandemic, and concerns on climate change issues, including flood insurance. Respondents included full- and part-time residents, natives and newcomers, and owners and renters of the properties. Twelve responses were collected thus far through semi-structured, open-ended interviews conducted via phone, Zoom, and in person in the summer and fall of 2021. Interviewees were snowball sampled.

Preliminary results suggests that while residents are increasingly aware of both climate risk and COVID-19 threats, decisions about coastal living are mainly based on livelihood and lifestyle preferences. While many respondents were aware of, or have even experienced, winter storms and floods that have devastated their neighborhoods, they continue to be content with their current residential choices. Residents have even increased their satisfaction with their residence and lifestyle (e.g., access to nature) during the COVID-19 pandemic, as they worked from home without commuting. This response was common across the respondents with different backgrounds. Meanwhile, this pilot study has also identified that Hull is increasingly favored by retirees, due to factors like housing affordability and access to nature. Further research is needed to explore the impact of the retiree influx on the area's social resilience, as the phenomenon could contribute to an increase in housing prices and social vulnerability for the seasonal residence pattern. Overall, this exploratory research suggests that the hazards are not the most important considerations for coastal residents, a finding consistent with prior research (e.g., Amundsen 2015) but worthy of additional investigation.

References

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Retreat in Real Time - Nantucket's Balancing Act Along a Changing Coast

- Devon McKaye, Resilience Planner, Arcadis (presenting)
- · Vince Murphy, Town of Nantucket, Sustainability Programs Manager

Nantucket, an island about 30 miles off the coast of Massachusetts, is no stranger to the concept of retreat. Along Nantucket's Baxter Road, high up on the Siasconset (Sconset) bluffs, retreat is unfolding in real time. Historically, the Sconset bluffs have been vulnerable to periodic erosion but, with climate change, sea level rise and increased storm intensity are expected to exacerbate the rate of erosion. Over time, the area behind the bluffs has been developed and now faces an uncertain future. While the debate over the best long-term solution for erosion in this area continues, the Town is balancing many competing interests including near- and long-term objectives, public and private priorities, and other considerations.

This presentation will explore the complexities of managing retreat and detail how the Town of Nantucket has leveraged their Coastal Resilience Plan and related planning and analysis efforts to better understand the nature of the risks along Baxter Road, explore potential alternatives, and work towards the development of a communitysupported and actionable roadmap for Baxter Road.

📢 Speakers



Bella Purdy Climate Resilience Planner Weston & Sampson



Diane Mas

Chief Resilience & Sustainability Officer Fuss & O'Neill, Inc.



Katherine Kahl

Extension Assistant Professor Sustainable Fisheries & Coastal Resilience, Gloucester Marine Station, University of Massachusetts Amherst



Kristin Uiterwyk

Director Urban Harbors Institute, University of Massachusetts Boston



Kanako Iuchi

Associate Professor Tohoku University



Devon McKaye

Resilience Planner Arcadis

3:30 PM

8A) What Happens With the Land After a Buyout?

3:30 PM - 5:00 PM, Jun 21

Growing numbers of property buyouts are raising a perplexing question for governments and communities: What happens with the land after a buyout? Who should decide, when, and how? This panel highlights cutting edge research from around the country, with an emphasis on the Northeast. It examines the need for and challenges of managing buyout lands for social and ecological healing, as well as strategies for implementing thoughtful approaches. Jamie Vanucchi (Cornell University) will share research on the actual state of buyout properties from three U.S. states (WA, TX, and NC), how different programs' land management plans affect the ecological conditions of these sites, and the challenges of measuring what counts as ecological restoration. Emma Zehner (Yale) complicates this picture by sharing research about the barriers that brownfields and other contaminated sites face in the buyout or property acquisition process and in post-buyout land management processes. Elyse Zavar (University of North Texas) will share research on the benefits of commemorating relocated communities to better support community healing, memory, and retaining social ties to place. Brooke Maslo (Rutgers) will share ongoing work around restoring Blue Acres-funded buyout parcels in New Jersey following Hurricane Sandy. Finally, Shanasia Slyman (Cornell University) will argue that buyout programs can be more effective if they better integrate land stewardship aspects into the buyout process and incorporate communities in managing and caring for the land after demolition. Mike McCann (The Nature Conservancy), who has been facilitating a series of "What Happens with the Land" conversations in New York City, will moderate the panel.

Session Chair: Linda Shi, Assistant Professor, Department of City and Regional Planning, Cornell University

Remembering after Relocation: The role of commemoration in buyouts

• Elyse Zavar, Associate Professor, Department of Emergency Management and Disaster Science,

University of North Texas

Relocation programs, such as buyouts, seek to provide residents opportunities to reduce their risk exposure to a range of hazards. However, relocating from a home deemed too hazardous for occupation frequently disrupts social ties and place attachment, especially for long-term residents and/or residents of close-knit communities. These broken emotional and social connections to people and place can add stress to those already experience trauma from a disaster and/or relocation. Commemoration provides an avenue to help residents maintain their connections to their former homesites as well as communicate to the public-at-large the hazards associated with that area. Despite these benefits, commemoration remains rare on post-buyout landscapes in the U.S. and abroad. This presentation examines successful post-buyout commemoration sites and offers best practices for remembering after relocation.

Reconciliation or Restoration? The Ecological Futures of Floodplain Buyout Sites

· Jamie Vanucchi, Associate Professor and Director of Undergraduate Studies, Cornell University

As climate change increases the frequency, severity, and reach of floods, governments and communities are increasingly relocating residents and retreating from low-lying areas. Buyouts of repeat-flood homes break the unsustainable and costly cycle of rebuilding damaged structures after disasters, but the process often ends with demolition of the building. While policymakers and many departing residents hope that this sacrifice will leave behind restored landscapes (Koslov, 2016), little is known about what actually happens to these sites (c.f. Zavar and Hagelman III, 2016). Do they become restored? To what? By what criteria should we assess what is on the site? Under what conditions do programs restore more sites to an ecologically dynamic condition? We explore these questions in the context of four programs in the United States that implement floodplain relocation or buyouts: Austin, Texas; Houston, Texas; Charlotte-Mecklenburg, North Carolina; and Washington State. We argue that there is no singular restoration goal or strategy, but a spectrum of options that run between ecological "restoration" to "reconciliation". We develop a framework that encompasses a set of land management activities along this spectrum. Drawing on satellite imagery and field verification, we assess the extent to which the 3,416 buyout parcels spanning 2,811 acres in these four regions implement these land management strategies. We also interview buyout program and land managers and staff. We find that each program adopts a very different management strategy, which results in distinct social and ecological outcomes. In our efforts to measure and assess the state of ecological restoration on buyout sites, we surfaced numerous questions about what restoration goals should be, how to measure them at state, national, or international levels, and how to assess change over time. Here we present our framework and typologies of program approaches, share findings and then consider programs' challenges and support needs. Responding to the gaps and needs we identify can help contribute to much needed floodplain restoration, reconciliation, and support the potential of floodplains to shift from risk zones to community assets and landscapes of value.

Survey of Federal, State, Local, and Community-Led Approaches to Flooding at Brownfields, Superfund Sites, and Other Contaminated Sites Left Behind

• Emma Zehner, Master of Environmental Management Candidate, Yale School of the Environment

There is growing focus on the risks that sea level rise and inland flooding pose to contaminated sites, such as brownfields, Superfund sites, and other industrial land. Sites once thought of as secure could spread contaminants, posing significant public health threats. As a result of discriminatory land use and housing policies, formerly redlined neighborhoods have disproportionately high concentrations of hazardous waste sites and higher flood risk. Studies have recently quantified the magnitude of the problem, but this issue is not new: at a 2000 public meeting related to the Environmental Protection Agency (EPA)'s Superfund program, a community advocate asked: why doesn't a site's location in a floodplain impact how likely a community is to qualify for relocation assistance if interested? Other communities have fought flooded sewage, mold, and other health threats associated with flooding for decades.

Buy-In Community Planning, a national nonprofit that engages communities in proactive planning to solve the challenge of chronic flooding, sought to find examples of effective approaches and identify potential funding sources to address this challenge. This research started with several questions: What federal and state funding exists to address contaminated sites left behind? What are communities already doing to address flooding at brownfield sites and Superfund sites? Do contaminated sites or other potential sources of contamination—such as underground storage tanks—pose barriers for communities interested in accessing buyout dollars through the Federal Emergency Management Agency (FEMA) and the Office of Housing and Urban Development (HUD)? This research found that federal remediation programs offer guidance but don't require grant applicants to implement remedial actions that account for climate impacts. It found that federal buyout programs, which often require a property to be remediated prior to acquisition, may pose some hurdles to commercial and, in some cases, residential properties near or on contaminated sites. Overall, this research finds that federal funding for flood mitigation, environmental remediation, and land restoration projects don't often overlap, which may prevent a streamlined, urgent approach to this problem.

This research also found examples of innovation. Community-research partnerships, such as Toxic Tides in California and LEAD Agency's mapping of abandoned coal mines and flooding in Oklahoma, are using data to propose policy changes. Communities are using innovative land banks, land trust, and land swap tools to fund acquisition and remediation. The Conservation Law Foundation is pursuing legal action against ExxonMobil for failing to prepare coastal facilities for climate impacts, resulting in spills that violate the Clean Water Act and Resource Conservation Recovery Act. Local governments are piloting solutions: New York City combined its environmental justice, climate change, and remediation offices and offers bonus funding within its brownfields program for flood-prone properties that take climate resilience measures. Two Oklahoma towns have used a combination of federal and local funding to proactively relocate facilities with hazardous materials. States have

intervened: North Carolina has historically acquired hog farms in flood-prone areas through the Swine Floodplain Buyout Program and Vermont's Flood Resilient Communities Fund may offer opportunities for both acquisition and remediation from a single funding source. Researchers have highlighted the important role that state legislation could play in forcing brownfields grant recipients to prepare for climate impacts. A California state regulator recently required a developer to repeat an environmental assessment with more accurate sea level rise predictions. Internationally, Australia's Environmental Protection Authority is funding testing and remediation for residents impacted by contamination spread by flooding. This paper highlights potential limitations of existing federal funding, identifies case studies of creative approaches, and based on these findings, offers several policy and programmatic recommendations.

Creating Flood-Resilient Landscapes in New Jersey Communities

• Brooke Maslo, Associate Professor, Rutgers University

Floods pose significant risk to human health and infrastructure in the landscapes where people live. In communities near the ocean, flooding and flood risk are often associated with catastrophic coastal storms, such as hurricanes and nor'easters. In New Jersey, we often think about Hurricane Sandy and the damage to life and property it caused. However, flooding is not just a coastal problem, nor is it only caused by severe storms. On the contrary, flooding has impacted nearly all of New Jersey's 565 municipalities. To address flooding concerns, New Jersey has implemented several initiatives to acquire flood prone properties through buyout programs. Removal of properties from within flood zones immediately promotes flood resilience by protecting human health and safety and reducing the risk of damage to personal property and infrastructure resulting from flood events. However, at least three new challenges emerge from buyout initiatives. Properties purchased with federal or state dollars must be managed as public open space, and they are deed restricted to protect against alterations that would reduce the landscape's capacity to absorb flood waters. Maintaining newly acquired areas using conventional techniques that are appropriate for park-like settings (i.e. mowing) adds an unsustainable burden on public staff and financial resources and is not a feasible long-term management approach for many communities. Similarly, leaving the properties alone and allowing 'nature to take its course' also is not a viable option. These challenges can be overcome through an ecologically centered landscape resilience approach that combines principles of engineering, ecology, and landscape architecture with social science to transform acquired properties into public assets. However, existing guidelines or best practices do not currently exist. We have published a primer that will serve as a guide for creating flood-resilient landscapes across the communities of New Jersey. Although much of this work focuses on landscape transformation of buyout areas, the information contained here applies to any landscape resilience project regardless of size or jurisdiction.

[Title TBC]

• Shanasia Sylman, Ph.D. Student, City and Regional Planning, Cornell University

Generally, the buyout process focuses on the social dimensions of identifying qualifying households, negotiating with eligible households, and supporting households through the emotional and bureaucratic process. By contrast, post-buyout land management often has very limited social engagement, especially where management plans prioritize biodiversity or hydrological function. We will review research in other fields that show how community and ecological health sustain each other to demonstrate the benefits of attending to socio-ecological systems. We then show how buyout programs in the United States segment the property purchasing process from floodplain management, housing relocation, community health, and ecological restoration. Many practical and systemic barriers inhibit better marrying social and ecological health in floodplain buyout programs are perceived and, therefore, supported. Our hope is that these suggestions are met with creativity and openness and spark ideas for innovation.

📢 Speakers

B

Elyse Zavar Associate Professor University of North Texas



Jamie Vanucchi

Associate Professor Cornell University



Emma Zehner Yale School of the Environment/Buy-In Community Planning



Brooke Maslo Associate Professor Rutgers University



Shanasia Sylman Ph.D. Student, City and Regional Planning Cornell University

8B) The Missing Link? Multilateral Institutional Arrangements for Planned Relocation (panel)

③ 3:30 PM - 5:00 PM, Jun 21

Decision-making and planning for climate-related relocation among national governments very often involves significant technical support from external stakeholders. Requests for support vary widely – how to create human rights-based policy guidelines, how to conduct technical assessments of what is a habitable risk or a suitable destination site, how to fund relocation with limited resources – and reflect the diversity of national contexts, approaches, and cultures that influence decision-making around relocation. Yet current responses from international organizations to government requests are ad hoc, unsystematic, and inconsistent. Unlike climate related displacement and migration of individuals and households, there is no obvious institutional home for the issue of community-wide planned relocation among multilateral organizations. As a result, while international guidance and insights about 'effective practice' exist within academia and some IOs, it can be difficult to operationalise at national and sub-national levels, and capacity-building support has been limited.

This raises the questions: 'how can the existing ad hoc network of multilateral institutions better support governments and affected communities from decision-making to implementation? Is a new institutional home the missing link?

This panel discussion aims to articulate the gap in institutional leadership on planned relocation at the international level and explore these implications this can have for decision-making in practice. After characterizing the gap, the session will then examine why this gap matters. What would frontline countries and communities gain from filling this institutional gap? Would a potential solution involve improving technical support and capacity building for governments? This support could include: normative developments tailored to national context, technical assessments, meaningful community participation, and access to funding. Finally, the panel will conclude with a discussion of potential new institutional arrangements that could represent ways forward to address this gap, assessing their pros and cons.

The overall purpose of this session is to bring together academics and practitioners concerned with governance and support for planned relocation at the international scale. Through a panel discussion, the session will catalyze dialogue on why the gap in institutional leadership on planned relocation exists (e.g., why it has "fallen through the cracks"), what filling this gap may achieve, and the advantages and disadvantages of potential new institutional arrangements to fill the gap.

€ Speakers

R

Rachel Harrington-Abrams Ph.D. Student King's College London



Erica Bower Stanford University
8C) Incorporating Scientific Data and Modeling into a Zoning Regulatory Framework: The County of Kaua'I, Hawaii

3:30 PM - 5:00 PM, Jun 21

The County of Kaua'i has initiated and adopted a number of climate hazard zoning ordinances that utilize the data from scientific studies to determine where or how construction can occur.

The purpose of this session is to go over how scientific modeling for climate change can be utilized in the drafting and implementing of built environment regulations. Regulatory standards for design and siting of structures around hazards is traditionally based on historic events, such as those regulations adopted under the national floodplain management program. However, climate change induced sea level rise in conjunction with increased intensity and frequency of storms and flooding events, will expand the extent of hazardous zones to previously unaffected areas. So how can zoning and building policies continue to allow development and construction in areas that will be impacted by climate change induced hazards without incorporating mitigating standards?

Climate scientists are generating a wealth of studies and projections on climate change's array of impacts. Can planners and policymakers use this information beyond just broad policy positions and visions and instead use these studies to physically regulate an area's built environment? Are there legal issues utilizing scientific projections to determine property rights?

Ka'aina Hull, the County of Kaua'i Planning Director, and Dr. Charles "Chip" Fletcher, the Interim Dean of the School of Ocean and Earth Science and Technology, University of Hawai'i will present on the Kauai Coastal Erosion Study and how a scientific study of Kauai's coastal erosion rates dictate building setbacks in one of the country's most progressive shoreline setback ordinances. They will also present on the State of Hawai'i's Sea Level Rise (SLR) Viewer that models coastal erosion, passive flooding, and annual high wave flooding impacts, and how Kaua'i has recently adopted a Sea Level Rise Zoning District Overlay with SLR design elevations required for all construction and development within this projected area of impact.

This discussion will also include the participation of a land use attorney, to give the legal landscape for land use regulations and scientific modeling. There are considerable legal obstacles to hazard mitigation regulations, but there are also strategies and methods to navigating and overcoming these challenges.

📢 Speakers



Planning Director County of Kaua'i

Ka'aina Hull

Charles "Chip" Fletcher

Interim Dean School of Ocean and Earth Science and Technology, University of Hawai'i

Ian Jung, Esq. attorney and land use entitlement practitioner

Thu, Jun 22, 2023

8:30 AM	9) Plenary Session ② 8:30 AM - 10:00 AM, Jun 22 ♥ Auditorium
10:30 AM	 10A) Ensuring Flood Buyout Participants relocate to Safe, Affordable Local Housing (panel) ② 10:30 AM - 12:00 PM, Jun 22

Government representatives and program practitioners from NJDEP Blue Acres and NJDCA Smart Move will introduce the Smart Move program, sharing and discussing the impetus, purpose, goals, and current progress to date. Panelists will focus on the crosswalk between the Blue Acres buyout program and the Smart Move new housing development program, calling out policy challenges, solutions, and opportunities that highlight the intersection between buyouts and housing and specifically how Smart Move can and will promote housing for vulnerable populations displaced by post-disaster flood buyouts.

Background on Blue Acres:

Blue Acres is a voluntary buyout and incentive program administered by DEP. Buyouts are acquisitions of properties located in a floodway, floodplain, or other Disaster Risk Reduction Area that reduce the risk from future flooding. Under Blue Acres, buyout properties will be voluntarily sold to DEP or their designee for current fair market value (post-storm value) and must be converted to and maintained per open space, recreational or wetlands management, or other disaster risk reduction practices. The program also may provide incentives to eligible homeowners to help them afford the costs related to relocating to a lower risk area.

Background on Smart Move:

The State of New Jersey is piloting a program that subsidizes the new development of quality, energy-efficient, resilient, and affordable housing in lower risk areas within or near disaster-impacted communities that are participating in NJDEP Blue Acres or other buyout programs that are supported by different funding sources. The program aims to provide safe housing for relocating residents so they may stay in or near their communities after selling their high-risk properties.

NJDCA will competitively select two communities to participate in the pilot. Once the eligible communities have been selected, DCA will procure private for-profit or nonprofit developers to build new housing that will be sold to qualified homebuyers or Blue Acres participants. In the initial pilot, DCA will prioritize qualified primary residential occupants who sold their high-risk owner-occupied homes through the Blue Acres Buyout Program.

The new developments will be built outside the 500-year floodplain and the inland or coastal climate adjusted floodplain, as defined by DEP. The site and housing designs will include additional resilience and energy efficiency construction standards, which will be defined in the program guidelines.

This project will be developed and implemented in close coordination with DEP to facilitate the relocation of Blue Acres Buyout Program participants into the new development, where feasible. If approved Blue Acres participants will be expected to utilize the net amounts of their buyout and incentive funds toward their new housing development purchase. At least 70% of the homes will be sold to LMI homeowners or homebuyers.

Speaker



Courtney Wald-Wittkop Manager, Blue Acres Program NIDEP

10B) European Approaches to Managed Retreat

🕗 10:30 AM - 12:00 PM, Jun 22

Climate mobility in Europe? Reviewing the evidence

- Michele Dalla Fontana, Postdoctoral Marie Curie Fellow at the Environmental Policy Group, Wageningen University, the Netherlands (presenting)
- Ingrid Boas, Environmental Policy Group, Wageningen University

The frequency of extreme weather events has increased over the last decades in different regions across Europe. According to the Internal Displacement Monitoring Centre (IDMC), just in recent years, extreme weather events have displaced hundreds of thousands of people. For example, heavy rainfall across western Europe in mid-July 2021 led to at least 84,000 displacements. In the same year, wildfires triggered around 155,000 displacements in Southern Europe. On top of that, the number of reported cases of relocation or planned retreat of settlements due to exposure to risks such as floods and Sea Level Rise is increasing (e.g. East Anglia and Norfolk counties on the eastern coast of England or the municipality of Almada in Portugal). Despite this, news media and politicians seem more interested in discussing climate change-induced mass migrations towards Europe rather than recognising people's internal mobility responses to environmental change. Furthermore, there is a geographical bias in the scientific literature as well, as research on climate change, environment and human mobility is underrepresented in European cases and mainly focuses on the Global South. This paper reviews where the discussion on the effects of environmental change on human mobility in the European context stands. To do so, we review the relevant scientific literature and a selection of European and National strategies on climate change adaptation and Disaster Risk Reduction to understand whether and how human mobility is contemplated in these frameworks. The present study is an initial attempt to fill the geographical gaps in the literature on environmental change and human mobility. At the same time, it questions the assumption that European countries can consider themselves immune to environmental change-related human mobility.

The efficiency of setback zones and retreat in reducing future urban exposure in Europe's coastal lowlands

- Claudia Wolff, Postdoctoral Researcher, Coastal Risks and Sea-Level Rise Research Group, Geography Department of Kiel University (presenting)
- Athanasios T. Vafeidis, Kiel University
- Hedda Bonatz, Kiel University

Future coastal risks will be significantly influenced, not only by sea-level rise and the intensification of extreme events, but also by where people decide to build and settle. Even though multiple studies have demonstrated that one of the most effective adaptation measures is to limit urban expansion inside the coastal floodplain, little research has been done to analyze the potential of land use-planning interventions in minimizing future coastal exposure in Europe. This study is a first-order EU-wide evaluation of the effectiveness of different coastal setback zones and retreat as an adaptation strategy for limiting upcoming urban exposure. We have developed countryspecific urban change models using machine learning techniques for all coastal EU Member states (plus BIH, GBR, and NOR,) for which data and Shared Socioeconomic Pathways projections were available and have assessed the amount of urban land in the coastal lowlands. Results show that the optimal designation of setback zones is country- or location-specific and mostly dependent on the type of shoreline and the morphology of the coastal profile/floodplain. Planning setback zones appears especially beneficial for nations with a long coastline such as Italy, Norway, France, Sweden, or Great Britain, as it is inherently more expensive and challenging to adapt to and protect long coastal stripes. Overall, coastal future urban exposure in the EU can be reduced by 47% if the most effective setback zone for each country is implemented (considering a high urban growth scenario). Additionally, our findings demonstrate that one of the most efficient approaches for the majority of EU countries to decrease urban exposure in the coastal lowlands is to establish a coastal setback zone by a specific elevation, i.e., construction is prohibited above a certain height above sea level. The results highlight the fact that how we design, construct, and develop urban space in the EU coastal lowlands will determine how exposed future urban areas are to sea-level rise.

Practitioner perspectives on accommodation and retreat in response to climate change in the Netherlands

- Carolien Kraan, PhD candidate, University of Miami (presenting)
- Marjolijn Haasnoot, Senior Researcher and Associate Professor, Deltares & Utrecht University
- Katharine J. Mach, Professor, University of Miami

The Netherlands considers itself the safest delta in the world due to its excellent flood risk management system. However, unless extremely ambitious reductions in global greenhouse gas emissions are implemented, the country will face significant climate change impacts over the coming centuries that will impact its water management system. Multiple scenarios have been presented for future adaptation options for the country as a whole. This study explores perspectives on accommodation and retreat as climate change adaptation options under increasing climate change in the Netherlands. We use an expert elicitation process, in which closed-form quantitative judgments are enriched through open-ended follow-up questions. In-depth, semi-structured interviews with >30 experts explore how accommodation and retreat can play a societally beneficial role in climate change adaptation. Experts have a variety of backgrounds, including academia, government, NGOs, and the private sector. This presentation will give an overview of the experts' range of perspectives on accommodation and retreat measures to be implemented, what forms they may take, barriers and opportunities to such adaptation measures, and how these could be overcome or harnessed to ease implementation.

Procedural justice in climate adaptation: assessing state-led (in)voluntary land use change and relocations in The Dutch Delta

· Lieke Brackel, PhD candidate, Delft University of Technology

If we do not stop the current trend of global warming, more land use change and relocations will have to take place in coastal areas all over the world. Also in the densely populated Dutch Delta, space is needed for adaptation measures such as water retention basins and dyke reinforcements (Alphen et al., 2022). The Dutch hydro-social system is highly engineered and requires continuous pumping and heightening of seawalls to allow for millions of people to live below sea level. In the name of future generations or other species, it can be argued that the Dutch need to loosen current coastal armouring strategies and give more space to exposure reducing measures such as managed retreat. However, historic myths about 'fighting the water wolf' represent deep cultural beliefs that favour keeping the water out. Moreover, rebuilding flexibility and delta dynamics would deeply affect the lives of farmers and house-owners currently living in the flood plains and polders to be transformed. Hence, even when managed retreat and land use change can be justified in certain places, the challenge is to address the conflicts and questions of justice that arise with buy-out programs and (in)voluntary relocations in the name of climate adaptation.

In this empirical ethical study, we assessed land use change conflicts and state-led relocations that have already occurred in Dutch water management to learn for the future. We use the Capability Approach as a framework for procedural justice and to conceptualise what is at stake for the citizens involved, focusing specifically on the political capability 'control over one's environment' (Holland, 2017; Nussbaum, 2011; Robeyns, 2017; Sen, 2009; Schlosberg, 2012). The Capability Approach to justice helps to point out what kind of public support different people need and how inequalities may be reinforced in adaptation transitions in different contexts.

In the Dutch case, salient options for differentiated public support were identified from in-depth conversations with 22 interviewees were: room for choice, stable and clear policies, rules and support for fair lobbying, and attention to peoples' divergent emotions and attachments. One important limitation of our findings is that differentiated public support requires more time and funding compared to one size fit all approaches. However, the conversations with citizens showed that small differences in the way people are treated or engaged with can

already make a difference for their experience of the (in)voluntary relocation process. When citizens have to deal with pending relocation plans and even expropriation, the uncertainty and long negotiating process resembles a true crisis in ones' life. Integrating ethical theory with the perspectives of citizens, legal experts and policy officers involved in state-led relocations provides a deeper understanding of what it means to have sufficient political control over one's environment in land use transitions. Water management is traditionally more technocratic and pays less attention to human emotions, so small ways to differentiate can already help to improve the process and give a place to the inherent loss associated with managed retreat.

Even though managed retreat is justifiable for all kinds of reasons, we still need to find better ways to address the loss and uncertainty citizens experience during (in)voluntary relocation processes to achieve just climate adaptation.

N Speakers



Michele Dalla Fontana Environmental Policy Group, Wageningen University, Wageningen, Netherlands



Claudia Wolff Kiel University (CAU)

Carolien Kraan PhD Candidate University of Miami



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Lieke Brackel Delft University of Technology

10C) Managed Retreat in NY and NJ I

② 10:30 AM - 12:00 PM, Jun 22

Barriers to housing mobility: A critical look at Uniform Relocation Act in NYC

- Hugo Sarmiento, Assistant Professor, Columbia GSAPP (presenting)
- Deborah Helaine Morris, Adjunct Professor, Columbia University

The Uniform Relocation Act ("URA") is a federal statute that establishes minimum standards for federallyfunded projects that require the acquisition of real property or displacement of people from their homes or places of business. Passed in 1970, the URA mandates consistent assistance, from notification, services, and compensation methodology for federally funded projects across agencies. Across federal programs and agencies, the reach and influence of the URA appears to be vast but both under-discussed and not well understood. In the context of federal disaster recovery programs, the URA is the backbone of property acquisition "buyout" programs, which are an increasingly significant component of climate adaptation programs in the United States today. There is evidence that buyout programs prioritize delivering resources to single-family homeowners and that the levers of assistance do not adequately support rental tenants, nor recognize or address long-term structural issues like the affordable housing crisis and the racial wealth gap, which disproportionately impact low income, BIPOC communities. This is not always well documented or meaningfully researched in a way that informs improvements in governance. This research will use the New York relocation experience as a case study to better understand how policy frameworks, such as the URA, have shaped housing mobility in the context of disaster recovery. The research seeks to answer: What are the policy barriers, in the URA, to housing mobility for impacted communities? How effective is the URA in supporting residents, namely low-income and communities of color, who historically, have been discriminated against in the housing market? It analyzes a new dataset constructed with support from the New York Governor's Office of Storm Recovery ("GOSR") [soon to be renamed "New York State Office of Resilient Homes and Communities"] the population of rental tenants that were permanently displaced by its post-Sandy buyout programs, to explore the program's relationship to underlying issue social difference and spatial inequality, including wealth inequality and patterns of racial segregation. Analysis of this dataset is complemented by interviews of government agencies and local experts.

Co-producing adaptation to flooding in urban communities: A case study of Rockaway peninsula in New York City

- Malgosia Madajewicz (presenting)
- Philip Orton, Research Associate Professor, Stevens Institute of Technology
- Ana Fisyak, Community Engagement Manager, Equinor
- Michaela Labriole, Director of Strategic Education Initiatives, New York Hall of Science

- Judith Hutton, Coordinator of Strategic Education Initiatives, New York Hall of Science
- Judah Asimov, NYC Economic Development Corporation
- Jeanne Dupont, Executive Director, Rockaway Initiative for Sustainability and Equity

Many urban areas are experiencing rapidly growing flood risk as sea levels rise. Managing the risk requires complex decisions that assess pros and cons of reducing risk in flood prone locations and relocating large populations. Despite public investments in risk reduction, communities who remain will continue to face residual flood risk. For example, flood barriers generally are designed to be closed only for flood events that exceed a certain threshold because closures have impacts on economic interests and ecosystems. Coastal residents can invest in reducing the risk of damage from flooding that will continue to reach their homes, but few residents have been making such investments even in places that are seeing rapidly intensifying flooding, and buy-out programs are still in their infancy. Much remains to be understood about motivating coastal residents to take action to adapt to flooding.

This study examines how co-producing an understanding of the benefits and costs of flooding with coastal communities influences attitudes about adaptation and adaptation behavior relative to simpler approaches that municipalities have been pursuing more commonly in their efforts to motivate residents to adapt through online communication and neighborhood outreach. The case study co-produced knowledge about current and future flood risk and benefits and costs of adaptation options in order to improve the capacity of coastal homeowners to make informed decisions about adaptation actions that they may be able to take with their own resources, such as elevating mechanicals in a home, floodproofing basements, installing alternative sources of energy, elevating homes, and relocating. An interdisciplinary team of scientists, educators, and staff from a non-profit coalition of community groups, with input from the City of New York, co-produced the knowledge with leaders of community groups of homeowners in the highly flood-prone Rockaway region of New York City (NYC).

The study uses a rigorous mixed method program evaluation methodology to assess if and how co-production of knowledge about flood adaptation options influences residents' attitudes and behavior relative to neighborhood outreach programs and online information provided by the City of NY. The qualitative component is based on transcripts from workshops in which community group members discussed the co-produced information and interviews with community members. The quantitative component is a difference-in-difference regression analysis that compares the change in attitudes and behavior over time among members of community groups which participated in co-producing the materials and members of community groups which did not participate. Both sets of groups had access to neighborhood outreach implemented by the City of NY and online resources. The researchers selected participating and non-participating groups. The difference-in-difference approach estimates the causal effect of the intervention under certain conditions.

The study makes two main sets of points. The first concerns understanding benefits of adaptation. Residents and decision makers continue to focus their concern on large flood events, whereas over the next thirty years the distribution of damages will change, with the preponderance of damages being caused by more frequent and less intense events, against which the currently planned flood barriers will provide little protection unless closures occur more often than planned. Focusing on events that will cause less of the total damages and are likely to be mitigated with infrastructure affects the effectiveness of adaptation choices. Furthermore, the commonly used assessments of the size of these damages are most likely underestimates, with implications for adaptation planning.

Second, co-production resulted in the investigation of different types of information than are communicated in neighborhood outreach and online. The information was much more specific to decisions that residents can make. The discussion of the decision-specific information changed attitudes toward adaptation action, with residents expressing more urgency and with a statistically significant increase in the percentage of residents who consider the residents themselves to be responsible for taking adaptation action. The study examines the change in attitudes and behavior over one year, which is insufficient to observe large changes in behavior. However, members of participating community groups began to take actions of which they were not aware before participating in the coproduced workshops. Inability to afford even the less expensive retrofits and lack of funding available to community groups pose a major obstacle as does the complexity of adaptation decisions, which depend on investments planned by the City of NY and likely actions by other residents. The results have implications for designing approaches to adaptation in coastal communities in the study area and in other urban settings.

A Senses of Justice and Contextual Equity Approach to Inform Land Restoration following Buyouts in Edgemere's Floodplain

• Veronica Olivotto, PhD Candidate of Public and Urban Policy, The New School

Scholarly work on managed retreat in the U.S.A has largely focused on understanding what are the acceptance factors for and against voluntarily relocating, as well as understanding the legal and policy implications based on occurred buyouts and acquisitions. Increasing attention is also placed on understanding the social justice implications of managed retreat. Research has focused on whether the opportunity to access buyouts is equitably spread, how the compensation schemes are designed and who they favor, and whether managed retreat processes are effectively reducing the vulnerability of households who embark on it. Less research has focused on those who stay and their lived experiences. Because the buyout processes take a long time, or because no more appealing option is available, or due to a sense of dependence on one's neighborhood, communities where MR happens are often broken apart, leaving behind a patchwork of vacant land and loss of sense of place. This study explores recognitional justice codified as 'senses of justice' collected through oral histories with 20 residents living in Edgemere (Rockaway, Queens, NYC), a low-lying majority-minority neighborhood where post hurricane Sandy buyouts, a long history of failed urban renewal has led to large amounts of vacant land. The interviews findings were complemented by observations at three community visioning events for land restoration and contrasted with quantitative analysis of neighborhood vulnerability change.

Towards A More Community-Driven Conversation About Risk and Relocation

• Paul Gallay, Director, the Columbia Center for Sustainable Urban Development's Resilient Coastal Communities Program

The proposed paper will analyze the conditions under which communities are brought into discussions around managed relocation and recommend a more community-driven approach to such discussions, based on findings from participatory research conducted with ten New York Metropolitan Area community organizations in the Spring of 2022. This research shows that gaining community support for managed relocation will require the abandonment of current "top-down" planning processes in favor of an approach that maximizes community empowerment, equity, accountability

and trust, as well as a close examination of potential alternatives to relocation.

Rehousing the Displaced: A Framework for New York City to Accommodate Renters Leaving the Floodplain

• Alex Miller, MS in Sustainable Environmental Systems, Pratt Institute School of Architecture

Without significant intervention, New York City's housing crisis will likely worsen by 2050 as the floodplain expands further into coastal neighborhoods, displacing residents and removing buildings from the city's housing stock. Housing is currently too scarce and expensive in the city to fully accommodate that displaced population. Additionally, most New Yorkers are renters, a group that is uniquely vulnerable to climate-borne inequities. This project was initiated to identify relevant components of New York's housing and climate crises vis-à-vis renters; assess how those components interact with each other and are governed; and locate solutions via City and State legislation, policies, and administrative practices. The presentation includes detailed recommendations to generate social housing in receiving communities, create equitable processes for managed retreat, and establish sustainable and just funding sources.

📢 Speakers



Hugo Sarmiento Columbia University

Malgosia Madajewicz

Associate research Scientist Center for Climate Systems Research, The Climate School, Columbia University



Veronica Olivotto

PhD Candidate Urban Systems Lab/ The New School



Paul Gallay

Director Resilient Coastal Communities Project, Columbia Climate School



Alex Miller

M.S. Sustainable Environmental Systems Pratt Institute, Graduate Center for Planning and the Environment

10D) Habitability: Empirical insights from the Field, and in Policy

② 10:30 AM - 12:00 PM, Jun 22

Social Structures Connected to Multiple Social Categories Can Cause a Differentiated Impact of Environmental Change on Perceived Habitability

- Simon Merschroth, University of Vienna (presenting)
- Jan-Niklas Janoth, University of Vienna
- Harald Sterly, University of Vienna
- Patrick Sakdapolrak, University of Vienna
- Mumuni Abu, Senior Researcher at the Regional Institute of Population Studies, University of Ghana

The loss of habitable land is increasingly recognised in environmental risk assessments. Changes in the habitability of a place hereby occur socially differentiated because the mechanisms behind these changes function socially differentiated. In detail, these inequalities are shaped by social structures connected to culturally constructed social categories. However, most works either stick to describing these differentiated outcomes or tend to analyse the underlying social structures connected to only one specific social category – rather than

looking at their intersection. Thus, only a small number of studies has explored how various social structures connected to multiple social categories intersect to contribute to socially differentiated impact of environmental change on perceived habitability. Accordingly, researchers have been calling for intersectional approaches in the analysis of environmental change within social sciences, including aspects of subjectivity, space, and time.

Building on empirical insights from qualitative field work in Northern Ghana and analysed through theoretical standpoints of Habitability and Feminist Political Ecology, we show that the interplay of different social structures resulting from norms and rules connected to multiple intersecting social categories can contribute to a socially differentiated impact of environmental change on perceived habitability. Hereby, social structures connected to gender interact with those connected to household characteristics, age, and socio-economic status to mitigate or exacerbate the influence of environmental change on perceived habitability. These perceptions are further influenced by an individual's position in space and over time. Moreover, subjective individual notions of well-being and their interplay with one's livelihood further navigates a person's perceived habitability across these intersections. Analysing this finding through the lens of Habitability and Feminist Political allows us to show how the impacts of environmental change are dynamically embedded within a socio-ecological system and shaped through subjective perspectives on it. Moreover, our findings problematise how adaptation to environmental change can contribute to the reinforcement of existing social categories. We thereby aim to add to informing socially nuanced policies in the field of environmental change and development that initiate socio-ecological transitions instead of reproducing social inequalities. Understanding that social structures are culturally constructed as opposed to existing naturally can thus contribute to transforming them.

Habitability to climate change beyond the point of no-return: co-designing adaptation plans and preparing for loss and damage

- Ariadna Anisimov, Postdoctoral researcher, University of Antwerp (presenting)
- Alexandre K. Magnan, Senior Research Fellow on vulnerability and adaptation to climate change, Institute for Sustainable Development and International Relations

The climate emergency is a reality. Climate change impacts are expected to intensify over the 21st century no matter what emissions reduction scenario. Communities in low-lying coastal areas, particularly in small island developing states (SIDS) are facing an existential risk to livelihoods from compounded climate challenges: extreme weather events and slow on-set (sea level rise). The most urgent question for policy and decision-makers is on the future and long-term (un)habitability of these coastal areas and the possibility of retreat and relocation.

Life beyond the point of 'no-return' under climate change requires more ground-rooted research on challenges linked to the historical ties to land, culture and risk perception, social acceptability of adaptation, land tenure and compensation. Specifically, empirical studies are needed to bring the voices of the communities at the forefront of climate change and habitability issues, in order to inform local-to-national and international adaptation policy and the design of compensation tools for non-economic losses associated with relocation. Adaptatin limits and Loss and Damage in this regard is a growing area at the science-policy interface, with major developments since COP26 in Glasgow and COP27 in Sharm el Sheikh. The key question emerges on how to design relevant funding arrangements and operationalize such a mechanisms that truly responds to local voices and views.

This presentation takes a critical look at opportunities for bridging ground rooted studies on adaptation limits, questions of habitability (and its definition, to whom) and what this means for the Loss and Damage debate at higher policy circles (UNFCCC). It calls for multi-disciplinary methods and case studies to support radical shifts in framing adaptation research and implementation that is based on bottom up approaches for codesigning adaptation pathways where coastal retreat and relocation go hand-in-hand with community empowerment, ownership and the fulfillment of fundamental rights.

Shifting the boundaries of habitable spaces? The interplay of migration and socio-cultural dimensions for constituting locally perceived habitability in a context of environmental change in Northern Ghana

- Jan Niklas Janoth, University of Vienna (presenting)
- Patrick Sakdapolrak, University of Vienna
- Harald Sterly, University of Vienna
- Simon Merschroth, University of Vienna
- Mumuni Abu, University of Ghana

The fairly differentiated range of environmental changes that are currently transpiring on global to local scale levels imply both sudden and long-term shifts in the respective habitability of places for its constituent populations, and will continue to pose challenges, especially to resource-dependent societies in rural areas. Places as local manifestations of environmental change will be particularly affected with regard to potential impacts, rendering a more thorough analysis of interconnected human-nature systems in particular places - and in their connection with other locales - an urgent necessity. Studies circling around notions of habitability are emerging as a promising field of research in that regard, especially when based on a foundation of socio-ecological systems theories. The renewed tailwind for human-centered approaches to socio-ecological systems research also brings the role of socio-cultural dimensions as fundamental determinants of well-being in socio-ecological systems to the fore with increasing vigor and emphasizes the need to incorporate the role of human migration as a dynamic social mechanism as well. This study provides an empirical starting point for extending existing theoretical foundations by providing much needed empirical evidence. The research is based on six weeks of fieldwork in a rural community in Northern Ghana and attempts to uncover the reciprocal interrelation of socio-cultural dimensions and human migration in an area where the perceived habitability is increasingly affected by negative environmental changes. We utilize a process-based and human-centered theoretical framework of habitability, which is informed by a socio-ecological systems perspective, and thereby especially intend to foreground the culturally-informed well-being component of the concept. Results show that socio-cultural dimensions are highly

relevant for the perceived configuration of local habitability and interact with migration in intricate ways. On the one hand, this research underlines the seminal role of socio-cultural dimensions for diversely shaping migratory trajectories, whilst also emphasizing that migration conversely impacts locally perceived habitability and underlying socio-cultural configurations on the other hand. Such locally-informed results are crucial for the implementation of well-tailored approaches aimed at increasing resilience and undergird the respective level of acceptance and support for measures that will likely fail without an appropriate cultural background check.

Migration and the Paris Agreement on Climate Change: A Right to Livability Going Beyond Loss and Damage

- Helene Benveniste, Postdoctoral Environmental Fellow, Harvard University (presenting)
- Simona Capisani, Durham University

Climate-related mobilities, that is the range of consequences that climate change has and will have on human mobility, is a complex and heterogeneous phenomenon. Depending on the context, climate change can either induce more movement – more likely within than across borders – or more immobility, with varying degrees of agency in the mobility outcome. Yet, despite this heterogeneity, in the current international policy landscape relevant for climate mobilities, key institutions predominantly focus on cross-border movement. The global climate change regime under the 2015 Paris Agreement is somewhat more expansive in its consideration of the challenges climate-related mobilities pose. Yet its focus remains narrow: first, it regards displacement as the central problem requiring address; second, it consigns climate mobilities to the Warsaw international mechanism for Loss & Damage. Consequently, the current institutional setup is both normatively and practically limited in its capacity to address the whole range of mobility outcomes resulting from climate change.

In this paper, we propose a novel normative framework for addressing climate mobilities, grounded in a right to a livable space. We argue that this framework addresses the heterogeneity of mobility outcomes and provides justificatory grounds for utilizing the Paris Agreement on climate change as a key governance framework. We show that it is advantageous in its capacity to allow for broader protection claims than competing normative paradigms, and that it circumnavigates issues of causality and responsibility introduced by these paradigms.

Crucially, we then discuss ways to implement a livability right in the Paris Agreement. In doing so, we critically examine the normative scope of Loss & Damage (L&D) and its newly prominent place in the climate regime. We highlight how the practical considerations posed by climate-related mobilities can clarify distinct normative interpretations of L&D. Given the recent momentum harbored by L&D at last year's Conference of Parties, our framework provides a timely foundation on which to base institutional set up of climate mobilities in the Paris Agreement that goes beyond where it currently stands.

Representing Retreat: How maps shape expert conceptions of habitability in regional climate change adaptation planning in Vietnam's Mekong Delta

· Lizzie Yarina, PhD Candidate, Massachusetts Institute of Technology

Vietnam's Mekong delta, as one of the world's flattest and lowest-lying geographies, is increasingly framed as a region facing imminent inundation by way of sea level rise. At the same time, converging local factors including sand mining, groundwater extraction, and infrastructure failures are leading to waterlogging and subsidence. Current efforts to adapt to environmental crisis in the region, domestic and international planners leverage maps to both visualize these problems and converge around possible solutions. Focusing on the Mekong Delta Integrated Regional Plan (MDIRP) approved in 2022 and authored by a Dutch consulting team, I consider how different representations conceptualize tradeoffs across space in time. In particular, how do maps shape expert conceptions of which zones are fit for habitation, and which should be relinquished to rising seas? And how do these diverge from the experiences of delta residents, the majority of whom make their livelihoods from less than one hectare of agricultural land?

Based on ongoing dissertation research, this paper presentation draws on one year of spatial-ethnographic research in Vietnam including expert interviews, resident interviews, document analysis, and field visits.



12:00 PM

1:30 PM

Preliminary findings indicate that the term retreat is treated as controversial and in general avoided where possible. Transitioning and repurposing are popular substitutes. This change in some cases originates from elected local government officials, in others from local government staff or consultants who managed the public engagement process. In general, the strategies do not view retreat as an urgent issue, but as something that needs to be considered in a couple of decades time. Local governments are unwilling to commit to options they cannot fund and that may prove to be unpopular with their electorates. In this regard, adaptation pathways approach provides local governments a way to broadly consider retreat without making any firm commitments. The couple of decades in between is expected to be useful for the local area residents to get used to the idea of transitioning. However, current plans and discussions do not provide a roadmap of how retreat can happen and be financed. The lack of even small scale pilot studies will make it difficult to implement when those decisions can finally be made.

Adaptation Capacity Reflects and Reinforces Intermunicipal Inequality

· Jon Nelson, Assistant Professor in Residence, Rhode Island School of Design

44 Feet: Vulnerabilities, opportunities, and strategies for managing risk from sea-level rise to Humboldt Bay's spent nuclear fuel site

- Alexander Brown, Graduate Research Assistant and Master's Candidate, Cal Poly Humboldt (presenting)
- · Jennifer Marlow, Assistant Professor of Environmental Law, Cal Poly Humboldt; founder of the 44 Feet Project

Practitioner Perspectives on Climate Mobility in South Florida

• Katharine Mach, Professor, University of Miami (presenting)

• Jennifer Niemann, Research Analyst at the University of Miami Rosenstiel School of Marine, Atmospheric, and Earth Science

· Rosalind Donald, Assistant Professor, American University

Nadia Seeteram, Postdoctoral Research Scientist, Lamont-Doherty Earth Observatory, Columbia Climate School

- A.R. Siders, Director, Climate Change Science & Policy Hub, University of Delaware
- Xavier I. Cortada, Artist and Professor of Practice, University of Miami
- Alex Nyburg, Department of Biology, University of Miami
- · Jessica Owley, Professor of Law, University of Miami
- Adam Roberti, Executive Director, Xavier Cortada Foundation
- Ian A. Wright, Department of Economics, University of Miami

Addressing climate-related human mobility through NDCs and NAPs: State of play, best practices, and the way forward

• Ann-Christine Link, PhD student and instructor, UNU-EHS

Speakers

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Aysin Dedekorkut-Howes

Griffith University

Jon Nelson

Assistant Professor in Residence Rhode Island School of Design



Alexander Brown Cal Poly Humboldt



Katharine Mach Professor University of Miami



Ann-Christine Link UNU-EHS

12B) Climate-Related Migration and the Private Sector I: How Did We Get Here? ② 1:30 PM - 3:00 PM, Jun 22

Speakers



Haley Gentry Senior Research Fellow Tulane Institute on Water Resources Law & Policy



Patrick Marchman

Principal / Associate Director, Climate and Sustainability KM Sustainability/InnSure



Liz Russell





Hannah Teicher Assistant Professor of Urban Planning Harvard Graduate School of Design



Jessica Mederson Partner

Stafford Rosenbaum LLP

Carolyn Kousky

Associate Vice President for Economics and Policy Environmental Defense Fund



Calandra Cruickshank

Founder and CEO StateBook International



Monika Serrano

Turner Construction

12C) Managed Retreat in NY and NJ II

I:30 PM - 3:00 PM, Jun 22

Developing a Buyout Program in New York City

• Tyler Taba, Senior Manager for Climate Policy, Waterfront Alliance

Council Member Tiffany Caban (District 22) is introducing a bill in the New York City Council to study the feasibility of developing a voluntary flood-zone home buyout program and fund.

The increasing threat of flooding requires a citywide voluntary buyout program. These programs have historically not prioritized individuals with higher need and lower adaptive capacity. Because buyout programs were not designed to manage relocation services, they've created perverse outcomes such as those found in the voluntary post-disaster buyouts in Staten Island, where 99% of the 323 households studied relocated to areas of higher social vulnerability, and 20% remained exposed to coastal flood hazards.

Buyout programs must transform into holistic relocation programs that help community members find safer areas to live, work, and operate, and that restore ecosystems. This includes redefining success to focus on relocation and restoration outcomes (affordable relocation in nearby safe and upland transit-connected areas, collective versus individual action, site restoration success, net increases in floodplain basin).

Waterfront Alliance supported Council Member Caban's office in the initial phase of drafting language for this bill. This panel/workshop would aim to foster a deeper dialogue about what a buyout program for New York City should look like. Waterfront Alliance would open the conversation up by outlining the existing considerations in the feasibility study, which would be followed by a collaborative conversation with members of the workshop/audience about what components might be missing and should be included in the study.

Ideally, members of the community would be in attendance and would help shape the bill and study's trajectory. Managed retreat and buyouts are highly controversial in communities that Waterfront Alliance works closely with through the Rise to Resilience coalition. The need for a buyout program is clear and bringing the community together to better understand this process is a critical component of ensuring the success of any such program.

Managed Retreat and Relocation: Evaluating the Relocation of Homeowners in the New York Rising Buyout and Acquisition Programs

- Peter Mattingly, Research Program Manager, NYS Office of Resilient Homes and Communities (ORHC) (Presenting)
- Alex Pennington, Director of Research and Strategic Analysis, NYS Office of Resilient Homes and Communities

While a growing body of research and practice has demonstrated the usefulness and importance of buyouts and acquisitions programs as part of resiliency and climate adaptation strategies, one underexamined aspect of these programs is the resulting patterns of relocation experienced by applicants. As buyout and acquisition programs are increasingly incorporated into disaster recovery and broader climate adaptation toolkits, it is also important to understand the relocation outcomes of the people selling their homes and moving. The New York State Office of Resilient Homes and Communities (ORHC) facilitated the New York Rising Buyout and Acquisition Programs were allocated \$656 million from the State's CDBG-DR funding following Superstorm Sandy. From a rigorous matching process through Lexis Nexis, we identified the relocation address of applicants in these programs to evaluate whether applicants increased or decreased their flood risk and what factors influenced an applicant's change in their flood risk status, as well as how their relocation address compares with their original address before Sandy. Overall, the results of this research demonstrate that the vast majority of matched applicants relocated within New York State and decreased their flood risk, with only 8% relocating to an area with the same flood risk, and just 0.3% matched applicants moving to an area with a worse flood risk profile. From this research, we evaluate the issues that many agencies and applicants alike face in the relocation process and what issues can be addressed or resolved to promote and equitable response.

Shaping the landscape of risk: federal transfers for floodplain interventions

Laura Geronimo, PhD Candidate, Rutgers University Bloustein School of Planning and Public Policy

How flood risk is conceived in the United States is embedded in political and moral economies that prioritize property rights (R. Elliott, 2021). The way we have negotiated the terms of flood risk and risk mitigation enable building and rebuilding in the floodplain, despite repetitive loss and damages (Kousky, 2018). If we understand flood risk, broadly, as the interaction between humans and the natural environment, then the land use and development choices people make are critical to determining flood risk (Burby & French, 1980). Land use decisions are primarily made at the local level but are impacted by intergovernmental transfers. In the context of climate change and disaster management, funds from federal agencies like FEMA and the USACE impact land use decisions through various programs like flood insurance and mitigation projects. However, the goals of federal mitigation projects sometimes come into conflict with homeowners' desires to be near water, and local officials' incentives to preserve their tax base. New Jersey is an interesting case study to observe these dynamics, given the high amenity value of the coast, strong municipal home rule, and programs at the state level to plan for climate impacts. We use a mixed methods approach to understand how federal transfers impact land use decisions in New Jersey's floodplain communities. Leveraging government databases, we map intergovernmental transfers for property interventions like buyouts and elevations. Through interviews with property owners, local, state, and federal officials, we explore diverse perspectives on how federal flows are impacting local land use, flood risk, and risk, are impacting local land use, flood risk, store perspectives on how federal flows are impacting local land use, flood risk, store perspectives on how federal flows are impacting local land use, flood risk, store perspectives on how federal flows are impacting local land use, flood risk, store perspectives on how federal flows are impacting local land use, flood risk, stor

social equity outcomes, and municipal finances. Preliminary findings identify negative externalities of programs that prop up risky property markets, conflicts and barriers to equitable buyout implementation, and leverage points to improve the social outcomes of intergovernmental transfers.

Cooperative Strategies for Just and Ecological Adaptation to Flooding in New York City

- Josh Rotbert, Research Assistant, Cornell University (presenting)
- Deborah Carlin, Assistant Researcher, Cornell University
- Julia Spande, Research Assistant, Cornell University
- Linda Shi, Assistant Professor, Cornell University
- Kate Boicourt, Director of NY-NJ Coasts and Watersheds, Environmental Defense Fund

Cooperative housing is one of the most common forms of housing in the New York City area and can be instrumental in preserving affordable housing. Almost a thousand low-income co-ops are located in New York City's floodplain, yet coops are excluded from many forms of flood risk mitigation funding and disaster aid, such as those provided by FEMA. These buildings are disproportionately vulnerable to flooding impacts because many are older, ineligible for flood insurance, have residents over 65 on fixed income, lack the reserves to make investments, and cannot afford to lose basement or first floor units. Research, policies, and funding have focused on public and single family housing, neglecting this prevalent form of multi-family housing. We respond to this gap through a research project that draws on spatial GIS mapping of flood risk exposure, a survey of cooperatives in the floodplain, interviews with building managers, and policy analysis. This presentation will share emerging findings on the impact of previous major flood events on the finances, the physical impacts of floods to buildings and their operations, and the ability of cooperative housing boards to navigate their responses. We conclude with a review of gaps in cooperative housing's access to resources and what lessons can be learned to inform changes to flood relief, flood risk mitigation policies, and broader adaptation programs. We propose a suite of policy and funding changes as well as green and gray infrastructure strategies to better help cooperative housing adapt to climate change.

A multi-hazard climate displacement compounding index for NYC

• Marco Tedesco, Lamont Research Professor, Columbia University

Displacement is one of the most urgent issues of cities nowadays, historically driven by aspects related to, for example, socio-economic, racial, social and infrastructure. In this regard, New York City is facing similar issues to large, expanding metropolises, specifically tensions arising from financial and economic pressure, on the one hand, and the increasing number of people that are moving within, to and from the five boroughs, on the other hand. We specifically refer to displacement in this work following the definition of the New York City Mayor's Office as the "the involuntary movement of an individual or family from their home or neighborhood, whether as the result of eviction, unaffordable housing costs, or poor-quality housing." To start addressing this issue, the NYC Mayor's office has recently released a Displacement Mapping tool, which allows to quantify and map displacement risk over the city, leveraging on the large datasets available throughout the city and from the most recent census.

However, one aspect that is currently missing from the tool is an understanding of the ways in which displacement and climate-related hazards intersect. The combined, compounding effects of displacement and climate hazards have the potential to further increase the exposure of socially vulnerable populations, amplifying and catalyzing the effects of the two aspects (displacement and climate change) when considered separately. Here, we report the results of the development of a multi-hazard climate and displacement compounding index for New York City developed within the framework of the New York City Panel on Climate Change's Equity Working Group. The index combines the risks associated with either climate change or displacement into an integrated index, and associated variables used to generate it, that allow the identification of those areas at high risk from both displacement and climate change. The index thus offers a tool to identify those areas where prompt interventions should occur in terms of mitigation and adaptation. The current version of the index includes five hazards (coastal flooding, riverine flooding, heatwaves, winter weather and hurricanes). Climate data and relative risks for the ranking of the index is obtained from the recently released FEMA National Risk Index. In the presentation, we report the procedures and tools used to obtain the index, its mapping and an analysis of how population and other socio-economic, racial and ethnic data have changed over areas identified at high risk.

Speakers

Tyler Taba Senior Manager for Climate Policy Waterfront Alliance

Peter Mattingly Research Program Manager NYS Office of Resilient Homes and Communities (ORHC)



Laura Geronimo Rutgers University - Bloustein School of Planning and Public Policy



Marco Tedesco Lamont Research Professor Columbia University



Josh Rotbert Research Assistant

12D) What does the habitability concept contribute to thinking on managed retreat?

🕑 1:30 PM - 3:00 PM, Jun 22

The United Nations Conference on the Human Environment held in Stockholm in 1972 marked a turning point in global concern about the environment. In the same year, Limits to Growth was released by the Club of Rome, projecting overshoot of global carrying capacity by the end of the 21st century in two of its three scenarios. Fifty years later, the climate crisis, rapid species loss and land cover change, and renewed anxieties about disease and nuclear warfare have revived concerns about global environmental insecurity and given them a renewed urgency. Recent scientific literature suggests that we have entered a period in history characterized by systemic, global and existential risks that threaten the future of the planet. Even if concerns over global existential risks are considered by some to be exaggerated, there remains concern over the sustainability of production systems, climate impacts, and other pressures on the environment in given localities, raising concerns over local habitability. Given past critiques of concepts like carrying capacity and concerns over environmental determinism, are there new approaches that acknowledge human agency and the potential for locally and globally creative solutions while recognizing that we live in a world of finite resources with limited ability to absorb the vast amounts of pollutants generated by modern consumer society. This panel, building on a Population-Environment Research Network (PERN) cyberseminar organized with the HABITABLE project, will engage in a discussion on the relevance of the concept of habitability, its use in the context managed retreat/realignment, and its theoretical and practical implications.

Session Chair: Alex de Sherbinin, Senior Research Scientist and Deputy Director, CIESIN, Columbia Climate School

Conceptualising habitability in a connected, unequal and changing world

• Harald Sterly, Senior Scientist University of Vienna

The contribution identifies three themes that need to be considered in order to make habitability a fruitful and operationalizable concept, from the perspetive of climate resilient development in an equitable and just way: A) the habitability of a place habitability must be seen as socially differentiated; members of a community conceive the habitability of a given place as different, depending on their positioning along intersecting axes of privilege and marginalization, unequal access to resources, and vulnerability. Thus, habitability is conditioned by structural factors from micro to meso level, but plays out very differently on the micro level. B) the habitability of a place cannot be seen in isolation from other, proximate and distal places and processes; it is constituted also through their connectivities to other places across space and scales. C) a focus on the (geophysical) hazard side is not sufficient to fully understand habitability; it is important to look also at the (often social) processes, drivers and root causes that result in changes. Integrating these three aspects with Horton et al.'s (2021) conceptualization, habitability needs to be seen as intersectionally differentiated, and as a product of the wider political ecology and political economy that binds place and people in larger scale economic, political and ecological structures, processes and flows of resources, finances, knowledge and people.

Habitability

• David Wrathall, Associate Professor, University of Oregon

I will present a formal model for assessing habitability that squarely deals with justice in two ways: 1) it assumes differential vulnerability as a starting point, and 2) requires an understanding of the constraints on governance, including power relations and historical political economies.

How to combine top-down habitability modeling with bottom-up social science research

• Alex de Sherbinin, Senior Research Scientist and Deputy Director, CIESIN, Columbia Climate School

📢 Speakers



Alex de Sherbinin Senior Research Scientist / Deputy Director CIESIN Columbia University

David Wrathall





Harald Sterly Senior Scientist University of Vienna

3:30 PM

13A) Managed Retreat in Hawaii 3:30 PM - 5:00 PM, Jun 22

Managed Retreat in Hawaii's Statewide Sea Level Rise Exposure Area: Planning and Policy Progress and

Challenges

- Bradley Romine, Coastal Management and Resilience Specialist, University of Hawaii Sea Grant College Program, Pacific Islands Climate Adaptation Science Center (presenting)
- Charles (Chip) Fletcher, Interim Dean, Director of the Climate Resilience Collaborative, School of Ocean and Earth Science and Technology, University of Hawai'i at Mānoa
- Colin Lee, Esq., Climate Change and Resiliency Policy Analyst, University of Hawai'i Climate Resilience Collaborative
- Juliette Budge, Operations Project Manager, Climate Resilience Collaborative, School of Ocean and Earth Science and Technology University of Hawai'i at Mānoa
- Amy Wirts, Coastal Lands Program Coordinator, University of Hawaii Sea Grant College Program
- Leah Laramee, Hawai'i Climate Change Mitigation & Adaptation Coordinator, State of Hawaii Department of Land and Natural Resources

Chronic and event-based coastal flooding and erosion are already widespread problems across the Hawaiian islands, including highly-publicized damage to coastal homes, hotels, coastal highways, and beach environments. Over the past few decades in Hawai'i, coastal property owners have erected seawalls and other hardening structures that exacerbate erosion, houses have fallen onto beaches or have been destroyed by large waves, and property owners have exploited local government's limited capacity for law enforcement by openly violating conservation laws. These instances have endangered beach users and marine animals, polluted nearshore waters, diminished public access and availability for enjoyment, and contributed to miles of lost beach across the state.

A unique collaboration between the State of Hawai'i and the University of Hawai'i through the Hawai'i Sea Grant Program and the Climate Resilience Collaborative (CRC) (formerly the Coastal Geology Group) produced a statewide Sea Level Rise Vulnerability and Adaptation Report and Sea Level Rise Viewer online mapping tool (hawaiisealevelriseviewer.com) that contains precisely mapped projections of passive (high tide) flooding, annual high wave flooding, and coastal erosion statewide at various intervals of sea level rise. Using this data and methodology from CRC, a combined Sea Level Rise Exposure Area (SLR-XA) was mapped statewide and made available in the online mapping tool. The SLR-XA map data provides a scientific basis for governmental and community actions to prepare Hawai'i for sea level rise. The SLR-XA map data provides a scientific basis for governmental and community actions to prepare Hawai'i for sea level rise. The methodologies for this research were subsequently peer-reviewed and published in Nature journal Scientific Reports (Anderson, et al. 2018).

Options for adapting to sea level rise impacts, including managed retreat of public infrastructure and private development from hazard areas, are being widely discussed with particular consideration of Hawai'i's island setting. This research has given state and local governments in Hawai'i an opportunity to utilize cutting-edge, peer-reviewed science in planning and policy approaches to facilitate managed retreat. Recent policy and planning successes at the state and county levels related to managed retreat in Hawai'i include increasing shorefront building setbacks, expanding authorities to transfer development rights outside of the SLR-XA, sea level rise hazards considerations in building permits and environmental assessments, requiring disclosure of sea level rise risk in private real estate transactions, considering sea level rise in long range and community development plans, executive directives requiring agencies to consider sea level rise in the decision making process, and establishing managed retreat funds.

This presentation will discuss notable incorporations of sea level rise science into state and local policy and planning, legislative challenges of approving these measures, and the projected impacts that these laws will have to facilitate managed retreat in Hawai'i. These and other policy and planning efforts are described in detail in a 2022 update to the Hawai'i Sea Level Rise Vulnerability and Adaptation Report available at: https://climate.hawaii.gov/hi-adaptation/state-sea-level-rise-resources/

Costs and Tradeoffs of Coastal Retreat in Response to Sea Level Rise: A Case Study of the North Shore of O'ahu, Hawai'i

- Makena Coffman, Professor of Urban and Regional Planning, Director for the University of Hawai'i at Mānoa Institute for Sustainability and Resilience (presenting)
- Rachael Han, Climate Impacts Research Specialist. University of Hawai'i at Mānoa Institute for Sustainability and Resilience
- Conrad Newfield, Research Assistant, University of Hawai'i at Mānoa Institute for Sustainability and Resilience
- Alice Terry, Research Assistant, University of Hawai'i at Mānoa Institute for Sustainability and Resilience
- Kammie Tavares, Research Assistant, University of Hawai'i at Mānoa Institute for Sustainability and Resilience
- Renee Setter, Research Assistant, University of Hawai'i at Mānoa Institute for Sustainability and Resilience
- Nori Tarui, Professor, Economics, Research Fellow, University of Hawai'i Economic Research

The consequences of human-induced climate change will force coastal communities to adapt at an unprecedented rate (Bindoff et al., 2007). Approximately one billion people residing near the coast globally are projected to be impacted by sea level rise (SLR) by 2100, with assets valued at US\$8-14 trillion (\$2011) (Pörtner et al., 2022). Unless the adaptive capacity of vulnerable and affected populations is addressed, coastal communities and environments will be severely and negatively impacted. The viability, longevity, and socio-ecological impacts of SLR response measures vary widely. Despite the urgent need for action, careful SLR response is necessary to avoid maladaptive outcomes, which tend to support actions that prioritize short-term benefits over long-term gains (California Coastal Commission, 2015; Pörtner et al., 2022). For example, the hardening of coastal areas with eroding sandy beach fronts can exacerbate coastal erosion, resulting in loss of the sandy beach, and perpetuate increasing risk to the public (California Coastal Commission, 2015; Hawai'i Climate Change

Mitigation and Adaptation Commission, 2021; Pörtner et al., 2022).

Many coastal managers have stated the importance of maintaining the wide array of uses and values of Hawai'i's beaches in the face of SLR, though there is little consensus on how this can be achieved (Bremer et al., 2022). To contribute to an understanding of SLR response for Hawai'i and other beach communities with retreat-oriented policies, this study identifies the costs of coastal retreat using a case study of Sunset Beach on the North Shore of O'ahu. We select this area because it is a world-famous beach that is experiencing chronic erosion exacerbated by SLR and seasonal wave events are threatening homes (Cocke, 2022). We identify the types of costs related to three approaches to retreat, i.e. retreat of existing infrastructure and dwellings that are implemented proactively, just-in-time, or reactively (Griggs & Reguero, 2021). The quantitative costs we assess are property acquisition (through voluntary buyouts or eminent domain); structure removal and remediation (both private structures and public infrastructure); loss of property tax revenues; and private property loss. Because we only consider retreat strategies, differences in environmental costs between retreat scenarios are relatively small (in comparison to in situ adaptation). We assess how costs accrue through the year 2100, including how costs are borne to either private or public actors. We categorize dwellings and infrastructure into the three types of retreat over the 80 year time horizon using Hawai'i-specific SLR maps that unpack passive flooding, coastal erosion, and high wave runup. There are additional social costs related to relocation (Mach & Siders, 2021), public safety and environmental pollutant costs related to falling structures, as well as litigation and enforcement costs that are considered qualitatively, but are outside the scope of our quantitative analysis.

Proactive Community Collaboration to Address Coastal Erosion Hazards and Increase Resiliency on the North Shore of O'ahu

- Lauren Blickley, Hawaii Regional Manager, Surfrider Foundation (presenting)
- Dolan Eversole, Coastal Management Specialist, University of Hawai'i Sea Grant College Program
- Bradley Romine, Coastal Resilience Extension Specialist, University of Hawai'i Sea Grant
- Stefanie Sekich, Sr. Manager Coasts and Climate Initiative, Surfrider Foundation

The North Shore coastline of O'ahu faces imminent threat from ongoing chronic coastal erosion, wave inundation and flooding that are worsening with climate change and sea level rise. These coastal hazards threaten public trust legacy beach areas and billions of dollars of public infrastructure and private property. The proliferation of shoreline hardening structures in the last 30 years, and the resultant widespread beach loss, illustrate the immediate need to develop holistic, long-term solutions for the area that include community-oriented values and place-based options.

In an effort to proactively address accelerated beach loss and improve community resilience on the North Shore, and thus ensure the long term protection of the public trust beaches and dunes, the Surfrider Foundation, The University of Hawai'i Sea Grant College Program, and SSFM International convened the North Shore Coastal Resilience Working Group (NSCRWG) for a series of discussions and assessment of response options in 2021 and 2022.

The NSCRWG is a community-driven, collaborative effort amongst diverse stakeholders to discuss and identify possible solutions for addressing increased impacts from coastal hazards within the North Shore planning district. The Working Group, selected by the conveners to represent a cross-section of community stakeholders, includes North Shore residents and landowners, state and local government staff, elected officials, coastal scientists, engineers, planners and nonprofits.

Over a series of six meetings, Working Group members identified three coastal erosion 'hot spots' on the North Shore, including Sunset/Kammies, Chun's/Laniākea and Mokulē'ia. The group also discussed coastal adaptation challenges and explored the relative merits, costs, benefits and feasibility of various solutions. NSCRWG members voiced strong interest in further exploring coastal adaptation options for the North Shore, including advancing discussions of managed retreat strategies toward actionable solutions and implementation.

With the urgency of beachfront homes presently on the brink of collapse on North Shore beaches, the most critically vulnerable 'hot spots' identified by the Working Group were identified as potential demonstration sites for adaptation, including managed retreat. The priority hotspot at Sunset/Kammies, for example, represents a late-phase geographic category of adaptation options due to the advanced nature of severe and ongoing coastal erosion fronting an extremely high-value public beach. This area is a high priority for consideration of more advanced adaptation options that may include limitations on new development (avoidance), relocation and removal of willing sellers of coastal lands.

Working Group members also overwhelmingly agreed on the importance of identifying phased adaptation options, including exploring short-term solutions like sand management and dune restoration. As such, two meetings were dedicated to exploring and applying the approach of adaptation pathways to North Shore erosion hot spots at Sunset/Kammies, Chun's/Laniākea, and Mokulē'ia.

Building on the need for a phased adaptation approach, the Working Group applied adaptation pathways for four separate planning horizons (current, nearterm, mid-term, and long-term) for each identified hot spot. Sample strategies were discussed and evaluated, and are envisioned to be part of future coastal land use and for management planning purposes. These strategies reflect a phased approach based on the planning horizons identified. The adaptation pathways provided are a starting point. The goal is that they will be more fully developed by city agencies in coordination with the North Shore community.

As part of these discussions, the group further identified seven critical concerns and six recommendations for immediate action by relevant organizations, agencies and policy-makers. The critical concerns and recommendations were released in the working group's 2022 final report entitled "Adaptive Coastal Management"

Recommendations, Actions and Strategies."

In addition to the issues and recommendations identified, one of the NSCRWG's key outcomes was building a group of informed and engaged citizens who were connected with technical expertise and government agencies. This project thus expanded the community's capacity to educate others within the community and advocate for action.

The NSCRWG effort represents one of the first community-based coastal adaptation working groups in Hawai'i. While the issues and recommendations identified are specific to the North Shore, they are relevant and timely to coastal communities statewide, serving as a starting point for similar discussions in other communities. The model of convening various community, technical, government and other perspectives to discuss and build a shared understanding and consensus about these complex issues, as well as how to address them, is one that can be replicated and built upon on the North Shore and elsewhere. The Working Group outcomes furthermore represent a starting point for more detailed evaluation and climate change adaptation planning for the North Shore that includes the evaluation of adaptation pathways, triggers for action and phasing of options at a variety of timescales.

The Public Trust Doctrine and Managed Retreat in Hawai'i

• Colin A. Lee, Esq., Climate Change and Resiliency Policy Analyst, University of Hawai'i Climate Resilience Collaborative

This abstract's argument is adapted from a law review article written by this author and published by the University of Hawai'i Law Review. Colin A. Lee, Eliminating the Hardship Variance in Honolulu's Shoreline Setback Ordinance: The City and County of Honolulu's Public Trust Duties as an Exception to Regulatory Takings Challenges, 43 U. Haw. L. Rev. 464 (2021).

Facilitating managed retreat in response to sea level rise in Hawai'i presents many challenges for the government, specifically in light of its constitutional duties under the public trust doctrine (the "PTD") to conserve and protect natural resources. For state and local governments, one prominent challenge of managing retreat is navigating complicated real property use issues with private coastal property owners as the ocean encroaches on their land. As this paper will discuss, a longstanding and dynamic legal mechanism, the PTD, dictates the final outcome with regard to balancing governmental duties with private property rights in Hawai'i.

Hawaii Land Acquisition Funds to Facilitate Managed Retreat

• Dolan Eversole, Coastal Management Specialist, University of Hawaii Sea Grant College Program

Climate change induced sea-level rise is having profound and wide-ranging global impacts on the environment, infrastructure, public health, and economy. Climate change projections and impacts are driving interest in regionally-tuned, sea-level rise adaptation strategies for potential application to coastal land use in Hawai'i. It has been well-established that chronic and event-based coastal hazards including flooding and erosion are widespread and increasingly frequent problems across the Hawaiian islands, including highly publicized damage to coastal homes, hotels, coastal highways and associated infrastructure, and beach environments. As a result of widespread chronic and episodic coastal erosion in Hawai'i, coastal property owners have erected seawalls and other hardening structures that can often exacerbate coastal erosion and beach loss. While the importance of sandy beaches in Hawaii is widely accepted by government and community groups, the specific socio-economic value of beaches and the related natural resources is largely unknown and therefore missing in the factors considered for coastal land use decision-making. A common alternative to mitigation and hardening is to protect coastal resources through preservation and conservation efforts. One tool for conservation is to acquire properties that are in the public interest to preserve such as beaches and dunes. There is growing interest in coastal land acquisition in order to protect beach resources in Hawaii but the idea is untested, expensive and not universally accepted by all stakeholders.

Adaptation policy application and implementation concentrates on adaptation pathways and triggers for action that contribute to resilience. Coastal land use adaptation for resilience can be categorized by function and outcome. General land use adaptation categories include; mitigation, accommodation, avoidance and preservation, each of these fields with distinct sub-categories and planning strategies. Academic review and critique of institutional and governance innovations and frameworks related to resilience-building adaptation initiatives provide a rich opportunity for assessment and comparison of various adaptation strategies and community-oriented collaborative planning. Assessing the impact and influence of natural hazard and disaster considerations at multiple geographic scales, including pre and post-disaster recovery policies provides context on how to effectively integrate climate adaptation with disaster planning. Application of local and regional climate adaptation plans and pathways can be significantly improved through established and emerging community civic engagement methods and collaborative planning frameworks.

₩ Speakers

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Bradley Romine Coastal Management and Resilience Specialist University of Hawaii Sea Grant College Program, Pacific Islands Climate Adaptation Science Center



Makena Coffman

Professor/Director University of Hawai'i at Mānoa Institute for Sustainability and Resilience

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Lauren Blickley

Hawaii Regional Manager Surfrider Foundation



Colin A. Lee, Esq. Climate Change and Resiliency Policy Analyst University of Hawai'i Climate Resilience Collaborative



Dolan Eversole Coastal Management Specialist

University of Hawaii Sea Grant College Program

13B) Climate-Related Migration and the Private Sector II: How Insurance, the Real Estate Industry, and Litigation Are Shaping Relocation Options (panel) (2) 3:30 PM - 5:00 PM, Jun 22

- Haley Gentry, Senior Research Fellow, Tulane Institute on Water Resources Law & Policy
- Patrick Marchman, Principal / Associate Director, Climate and Sustainability, KM Sustainability/InnSure
- Liz Russell, Louisiana State Director, Environmental Defense Fund
- Hannah Teicher, Harvard Graduate School of Design
- Jessica Mederson, Partner, Stafford Rosenbaum LLP
- · Carolyn Kousky, Associate Vice President for Economics and Policy, Environmental Defense Fund
- Monika Serrano, Turner Construction (moderator)

€ Speakers

Haley Gentry Senior Research Fellow Tulane Institute on Water Resources Law & Policy



Patrick Marchman

Principal / Associate Director, Climate and Sustainability KM Sustainability/InnSure



Liz Russell

Louisiana State Director Environmental Defense Fund



Hannah Teicher Assistant Professor of Urban Planning Harvard Graduate School of Design



Jessica Mederson Partner Stafford Rosenbaum LLP



Carolyn Kousky Associate Vice President for Economics and Policy Environmental Defense Fund



Monika Serrano

Turner Construction

13C) Modeling and Visualizing Climate Mobility and Managed Retreat (2) 3:30 PM - 5:00 PM, Jun 22

Modeling migration out of Central America and West Africa

- Fabien Cottier, Columbia University (presenting)
- Brian Katz, Oregon State University
- Ángel Muñoz, Barcelona Supercomputing Center
- Carmen Gonzalez Romero, Barcelona Supercomputing Center
- Michael Puma, Columbia University
- · Jennifer A. Nakamura, Columbia University
- Richard Seager, Columbia University
- Alex de Sherbinin, Columbia University
- David Wrathall, Oregon State University

Livelihoods on the Move: Towards fine-scale climate mobility modelling in India

• RJ van Duijne, Postdoc, CIESIN, Columbia Climate School

Leveraging CHC-CMIP6 High-Resolution Climate Projections for Anticipating Future Human Mobility and Habitability Worldwide

- · Cascade Tuholske, Assistant Professor, Montana State University (presenting)
- Emily Williams, UCSB
- Chris Funk, UCSB
- Pete Peterson

Immersive Virtual Reality as a Communication Tool towards the Development of Floating Cities for Climate Adaptation

• Shengzhe Wang, Assistant Professor, University of Colorado Denver (presenting)

• Bing Han, Assistant Professor, University of Colorado Denver

€ Speakers

Fabien Cottier

Postdoctoral Research Scientist Columbia University



RJ van Duijne

postdoc CIESIN, Columbia University



Cascade Tuholske Asst. Professor Montana State University

Shengzhe Wang Associate Professor University of Colorado Denver

13D) Community Engagement in Managed Retreat ② 3:30 PM - 5:00 PM, Jun 22



Fri, Jun 23, 2023

Modelling human displacement in Pakistan flood 2022: An assessment of opportunities and limitations

- Pui Man Kam, PhD candidate, Weather and Climate Risks, ETH Zurich (presenting)
- Steffen Lohrey, TU Berlin
- Tabea Cache, University of Lausanne
- Bianca Biess, ETH Zurich
- Sabrina Di Vincenzo, Politecnico di Milano
- · Radley M. Horton, Columbia University
- · Lisa Thalheimer, United Nations University

Racing against floods: novel estimates of vehicle flood exposure and vehicle flood damages in the United States

• Steven Koller, PhD candidate, Environmental Science and Policy, University of Miami Rosenstiel School of Marine, Atmospheric, and Earth Science

Demographic exposure to extreme heat and flooding

- Andrew Zimmer, Postdoctoral Researchers, Montana State University (presenting)
- · Cascade Tuholske, Assistant Professor, Department of Earth Sciences, Montana State University
- Nina Brooks, Assistant Professor, School of Public Policy, University of Connecticut

Carolynne Hultquist, Lecturer, School of Earth and Environment, University of Canterbury, Christchurch, New Zealand

Missed opportunities: Barriers to managed retreat in Sumas Prairie, BC, following the 2021 floods

- Felicia Watterodt, Master of Environmental Studies candidate, University of Waterloo (presenting)
- Brent Doberstein, Associate Professor, University of Waterloo

Who Benefits from Flood Adaptation?- Evidence from US wide time series data

- · Lidia Cano, PhD Candidate, Massachusetts Institute of Technology (presenting)
- ChangHoon Hahn, Postdoctoral Research Scientist, Princeton University

Relating social, ecological, and technological vulnerability to future flood exposure at two spatial scales in four U.S. cities

- Jason Sauer, Postdoctoral Research Fellow, Portland State University (presenting)
- Arun Pallathadka, Portland State University
- · Heejun Chang, Portland State University
- · David Iwaniec. Portland State University
- Elizabeth M. Cook, Barnard College
- · Gregory C. Post, Portland State University
- · Idowu Ajibade, Portland State University
- · Marta Berbés-Blázquez, University of Waterloo
- Nancy B. Grimm, Arizona State University

Speakers

Pui Man Kam PhD student ETH Zurich

S

Steven Koller

Environmental Science and Policy PhD Candidate University of Miami Rosenstiel School of Marine, Atmosheric, and Earth Science



Andrew Zimmer

Postdoctoral Researcher Montana State University



Felicia Watterodt Graduate student University of Waterloo



Lidia Cano Doctoral Candidate Massachusetts Institute of Technology



Jason Sauer

Postdoctoral Research Fellow Portland State University

14B) Financial Aspects of Adaptation and Managed Retreat

🕑 8:30 AM - 10:00 AM, Jun 23

Out of Africa, Few Green Bonds: African Sovereigns, Climate Action and International Finance

- · Harry Verhoeven, Columbia University (presenting)
- · Gautam Jain, Columbia University

Exploring price effects of sea level rise exposure across race and income: evidence from property sales in the southeastern United States

• Steven Koller, Environmental Science and Policy PhD Candidate, University of Miami Rosenstiel School of Marine, Atmospheric, and Earth Science

Measuring the Impact of Managed Retreat

- Mark Rhoads, MBA Candidate, Bard College
- · Sarah Haworth, MBA Candidate, Bard College
- Maria He, MBA Candidate, Bard College
- Shahbaz Soofi, MBA/MS Candidate, Bard College
- Nicole Jean Christian, Empire State Fellow, NYS Department of State
- Jordan Koster, Excelsior Service Fellow, NYS Department of State
- · Carolyn Fraioli, Coastal Resources Specialist, NYS Department of State

Who Pays? Emerging possibilities for resourcing managed retreat

- · Michael Howes, Associate Professor, Griffith University (presenting)
- · Andrew Buckwell, Griffith University
- · Justine Bell-James, University of Queensland
- · Margaret Cook, Griffith University
- Aysin Dedekorkut-Howes, Griffith University
- Ed Morgan, Griffith University
- · Johanna Nalau, Griffith University

Speakers

Harry Verhoeven

Columbia University (SIPA)

Steven Koller

Environmental Science and Policy PhD Candidate University of Miami Rosenstiel School of Marine, Atmosheric, and Earth Science

Mark Rhoads

Principal Bard College\Grimshaw



Michael Howes Associate Professor Griffith University

14C) Natural Disasters and Managed Retreat 🕘 8:30 AM - 10:00 AM, Jun 23

Managed retreat due to natural hazards: A decision support framework based on case history analysis in Switzerland

- Flurina Dobler, Master of Science candidate, University of Zurich (presenting)
- Christian Huggel, University of Zurich

• Samuel Weber, WSL Institute for Snow and Avalanche Research, SLF Davos Switzerland & Climate Change, Extremes and Natural Hazards in Alpine Regions Research Center CERC

How Does Housing Recovery and Relocation Process Disconnect or Reconnect in Neighborhoods? A Case Study of Relocation Program and Disaster Public Housing in a Tsunami Impacted City in Japan

· Kensuke Otsuyama, Project Lecturer, The University of Tokyo

Stability and change in U.S. migrations systems after disasters

• Elizabeth Fussell, Professor of Population Studies and Environment and Society, Brown University; Editor-in-Chief, Population & Environment (presenting)

- Kathryn McConnell, Postdoctoral Research Associate, Brown University
- Jack DeWaard, Associate Professor, University of Minnesota and Population Council
- · Katherine Curtis, Professor of Sociology, University of Wisconsin-Madison

How disaster recovery decision-making unfolds: Investigating retreat and rebuild options for post disaster recovery in Merritt, British Columbia after the 2021 British Columbia floods

· Shaieree Cottar, PhD candidate, University of Waterloo

Building a "wildfire managed retreat" research agenda

• Kathryn McConnell, Postdoctoral Research Associate, Brown University (presenting)

• Liz Koslov, Assistant Professor, University of California Los Angeles Department of Urban Planning and Institute of the Environment and Sustainability

Managed retreat following the 2010 eruption of Mt. Merapi, Indonesia: managing tradeoffs between volcanic hazard and livelihoods risks

• Brent Doberstein, Associate Professor, University of Waterloo

Speakers

Flurina Dobler

2021: Bachelor of Science UZH in Geography, Minor in Environmental Studies. Bachelor Thesis: Glacial Lake Outburst Floods: Topographic, geomorphological, and climatic controls on glacial lake distribution and outburst hazard in high mountain regions across the globe. Grade: 5.75 out of 6 2023: expected completion of Master of Science UZH in Geography with a specialization in physical geography. University of Zurich, Switzerland



Kensuke Otsuyama

Project lecturer The University of Tokyo



Elizabeth Fussell

Stability and change in U.S. migration systems after disasters Brown University



Shaieree Cottar

PhD Candidate & Coordinator for the Candian Coastal Resilience Forum University of Waterloo



Kathryn McConnell

Postdoctoral Research Associate Brown University Population Studies and Training Center



Brent Doberstein

Associate Professor University of Waterloo

14D) South Pacific and Small Island States

🕑 8:30 AM - 10:00 AM, Jun 23

Assessing climate risk to habitability in atoll islands and implications for adaptation

- Alexandre K. Magnan, Senior Research fellow, IDDRI (presenting)
- Virginie K.E. Duvat, La Rochelle University-CNRS
- Chris Perry, University of Exeter
- Tom Spencer, University of Cambridge
- Johann D. Bell, University of Wollongong and Conservation International
- Colette C.C. Wabnitz, University of British Columbia and Center for Ocean Solutions
- Arthur P. Webb, United Nations Development Programme
- Ian White, Australian National University
- Kathleen L. McInnes, CSIRO
- Jean-Pierre Gattuso, Sorbonne Université and CNRS
- Nicholas A. J. Graham, Lancaster University
- Patrick D. Nunn, University of the Sunshine Coast
- Gonéri Le Cozannet, French Geological Survey

Science warns against a more precarious future for ecosystems and the most vulnerable people due to i) a likely sharp increase in climate risk over the course of the 21st century, and possibly beyond; ii) the inevitability of some degree of climate risks even under ambitious mitigation and adaptation efforts; iii) the progressive reaching of adaptation limits across regions and sectors; and iv) the potential shrinking of the "solution space", i.e. the range of options available for adaptation. In such a context, a key question refers to our ability to assess when climate risk will reach "severe" levels and call for deeply transformative adaptation responses to become fully effective. This communication will present an expert judgment-based methodological framework to assess climate risks to the future habitability of low-lying coastal areas, with an application to atoll islands.

During its Sixth Assessment Report (AR6), the IPCC's Working Group II further developed the work done in the AR5 (2014) to define and assess "key risks" resulting from changes in climate hazards and/or in socio-ecological systems' exposure and vulnerability. The initial motivation was to identify risks that could qualify as 'dangerous anthropogenic interference' in the climate system, as emphasized by Article 2 on the UN Framework Convention on Climate Change (UNFCCC). In low-lying coastal areas as in other highly climate-sensitive geographies (e.g. Arctic regions, high mountains, desert margins), 'dangerous anthropogenic interferences with the climate system' mean the risk for these areas to become uninhabitable in the coming decades, with cascading implications in terms of cultural loss, economic decline, and population movements.

Ta assess 'severe climate risk', the WGII used a framing composed of four criteria (magnitude of adverse consequences; likelihood of adverse consequences; temporal characteristics of the risk; ability to respond to the risk) and three additional qualifiers (irreversibility of consequences; potential for thresholds beyond which the

magnitude or rate of an impact substantially increases; and potential for cascading effects within and beyond system boundaries). This framing is valuable but does not fully resolve the underlying challenge of identifying the level at which "severity" is reached, that is, the risk thresholds that irreversibly push coastal systems to their adaptation limits. All the more so that defining 'key risk' is acknowledged to be intrinsically dependent on context-specific social and cultural values, especially when applied at local scales. Here, we argue that moving further requires to consider a more place- and people-based approach, what the concept of habitability actually allows for.

Habitability indeed refers to the ability of a socio-ecological system to support human life by providing protection from hazards and assuring adequate space, food and freshwater, as well as contributing to productive livelihoods (subsistence and/or economic), human health and societal well-being over generations. So that specific thresholds in climate-induced habitability loss could be considered triggering 'severe risks'. In terms of driving factors, next to geo-bio-physical settings and cultural values, habitability also strongly depends on the adaptive capacity of the local institutions and inhabitants to cope with and anticipate climate changes, which in turn relies on both tangible (e.g. technological, financial and governance arrangements) and intangible (e.g. traditions) resources.

Few frameworks actually exist to assess climate risks to habitability in a pragmatic way, and for various warming scenarios and timeframes. In this communication, we will present one (see https://doi.org/10.1002/wcc.700) that we developed in the context of atoll islands and identifies five 'Habitability Pillars' or safe spaces from climate threats: Land, Freshwater supply, Food supply, Settlements and infrastructure, and access to Economic activities (including subsistence activities). Other important human dimensions such as cultural identity and human health, for example, are not considered as habitability pillars per se, but rather as both underlying drivers of vulnerability, and outcomes of response to climate risk to land, freshwater, food, settlement and economic and subsistence resources. The framework investigates the cumulative risk arising from multiple drivers (beyond coastal erosion and marine flooding only: sea-level rise + changes in rainfall + ocean–atmosphere oscillations and tropical cyclone intensity + ocean warming and acidification) to the five Habitability Pillars. It is based on an expert judgment method supported by a scoring system, has been applied to urban and rural islands in the Pacific (Western and Central) and Central Indian oceans, and contrasted two warming scenarios (RCP2.6 and RCP8.5) and two time horizons (2050 and 2090).

The results show that risks to habitability will be highest in the Western Pacific which will experience increased island destabilization together with a high threat to freshwater, and decreased land-based and marine food supply from reef-dependent fish and tuna and tuna-like resources. Risk accumulation will occur at a lower rate in the Central Pacific (lower pressure on land, with more limited cascading effects on other Habitability Pillars; increase in pelagic fish stocks) and the Central Indian Ocean (mostly experiencing increased land destabilization and reef degradation). Last, the levels of risk to habitability will vary significantly between urban islands, depending on geomorphology and local shoreline disturbances; and rural islands will experience less contrasting risk levels, but higher risks than urban islands in the second half of the century.

This communication will first focus on the methodological aspects: habitability framing, bases of the expert judgment exercise (indicators and assessment process), use of real-world local case studies to inform atoll island archetypes, etc. The aim will be, besides informing on the approach itself, to allow for a broader discussion with the audience, assuming that our framing applies to low-lying coastal areas in general, and even possibly to non-coastal systems (provided minor methodological adjustments). Second, we will discuss the lessons learnt in terms adaptation: how does a better understanding of future climate risk to habitability help shape a longer-term perspective on adaptation? And in particular, how does it help highlight the need for considering managed retreat as an important adaptation strategy for the long-term?

Assessing the feasibility and relevance of internal relocation in atoll settings: application to Rangiroa Atoll, French Polynesia

Virginie Duvat, Professor of Coastal Geography, UMR LIENSs 7266, La Rochelle University-CNRS (presenting)

- Alexandre K. Magnan, Institute for Sustainable Development and International Relations
- Lydie Goldner-Gianella, Laboratory of Physical Geography, University Paris 1 Panthéon-Sorbonne
- Delphine Grancher, Laboratory of Physical Geography, CNRS
- Stéphane Costa, Normandie Univ, Unicaen, CNRS, LETG
- Olivier Maquaire, Normandie Univ, Unicaen, CNRS, LETG
- Gonéri Le Cozannet, DRP R3C, BRGM
- Lucile Stahl, UMR LIENSs 7266, La Rochelle University-CNRS
- Natacha Volto, eng., UMR LIENSs 7266, La Rochelle University-CNRS
- Cécilia Pignon-Mussaud, eng., UMR LIENSs 7266, La Rochelle University-CNRS

Atoll islands are highly vulnerable to climate change because they are low-lying, small, and dependent on climate-sensitive coral reefs. Flooding has adverse consequences on freshwater availability, subsistence and commercial activities, infrastructure and buildings, and is will likely render some islands uninhabitable from the mid-century. Four main adaptation responses are currently used to contain climate risk in atoll contexts. The prevalent option is island 'fortification', although it has failed in many locations and proved maladaptive. The second option, inapplicable in urban environments experiencing altered ecosystems, consists of using Nature-based Solutions. The third option, increasingly considered, is island raising, which consists in creating new elevated islands. The fourth option commonly put forward is international migration, increasingly considered a last resort option because of the failure of past experiments, its unpopularity, and limited political support from targeted host countries.

Internal relocation, that is, population relocation to a higher part of the same atoll island or to a higher island within the same atoll has rarely been considered as an adaptation strategy in atoll contexts. Its relevance and feasibility on a given atoll have never been assessed, first, because the room to move back is very limited, and

second, because atoll islands are considered all highly susceptible to flooding. Yet, geomorphic studies showed that some atoll islands are less flood- and risk-prone than others. To contribute addressing this gap, we provide the first assessment of the potential for anticipatory and government-led internal relocation as a decisive adaptation strategy in the face of climate change and SLR in atoll

Re-emplacement: the active remaking of climate-impacted place

contexts, using Rangiroa Atoll, French Polynesia, as a case study.

- Carol Farbotko, Griffith University (presenting)
- Taukiei Kitara, Independent Researcher, Tuvaluan Indigenous knowledge holder

How is resistance to relocation practiced? Far from a passive form of immobility or an irrational response to risk, people facing possible uninhabitability can and do remake and actively reclaim their (im)mobilities, homes and places. Such practices need to be empirically documented and theorised if planned relocations and managed retreat are to be equitable and open to the voices of affected populations. Advancing such an agenda, this paper explores the concept of re-emplacement – the active remaking of climate-impacted place – in the context of Tuvalu. Subject to 'inevitable uninhabitability' narratives for three decades, re-emplacement in Tuvalu includes diverse but culturally, politically and economically consistent practices that together enact a clear message of voluntary immobility, from grassroots to state. These include migration from urban to rural areas, revitalising Indigenous senses of place, large-scale land reclamation, and sustained lobbying the international community for emissions reductions. Re-emplacement is suggested as a useful conceptual tool in understanding resistance to relocation.

Enabling conditions for planned relocation in Fiji

· Celia McMichael, University of Melbourne

This presentation focuses on Fiji, located in the Pacific Islands, a region often characterized by high climate change vulnerability and limited adaptation options. Impacts of climate change in the Pacific Islands include increasing droughts and water scarcity, and coastal flooding and erosion. Pacific Island communities are increasingly using strategies to adapt their lives and livelihoods to climatic changes and associated risks, including planned relocation and retreat from sites of risk. Yet there remains limited analysis of the 'enabling conditions' for adaptation and relocation/retreat, including in the Pacific Islands. Drawing on longitudinal qualitative research conducted since 2014, this presentation examines the conditions that enable (and constrain) relocation/retreat in Vunidogoloa and Nagigi villages in Fiji: e.g. asset and resource distribution; flexible adaptation options; social organization; agency; experiential and communicated learning; and worldviews and values. Notably, Fiji is one of the first countries in the world to develop National Guidelines for Planned Relocation, and this provides a relevant political and policy context for emerging cases of relocation.

Planned Community Relocations in Fiji: What Lessons Could Apply to the United States

· Barrett Ristroph, Ristroph Law, Planning, and Research

In the United States, there is no clear formula for community relocation. Assistance is often at the individual/household level, while community-scale relocations require a mess of environmental review and funding among siloed agencies. Fiji offers a different path. Following the development of Planned Relocation Guideline in 2018, the Fijian Government is developing standard operating procedures that include a procedure for culturally sensitive negotiation with villages considering relocation as well as a process for determining whether and where to move. Because most of Fiji lands are held traditionally through customary title, which cannot be bought or sold, relocation is a sensitive issue used only as a last resort, brokered through the ministry responsible for overseeing customary lands (Ministry of iTaukei Affairs). A request for relocation assistance must come from the village headman (the locally elected liaison to the Fijian government). This initiates a process where a Task Force of Fijian agencies with specialization in various aspects of relocation (consisting of individuals trained to collect data in a culturally sensitive manner) assess the status of the community. Ninety percent of current residents must agree to relocate and the Task Force must find that the village meets a specific threshold of uninhabitability based on geographic threat and deteriorated living conditions). Otherwise, the Task Force will assist with protect-in-place measures. If relocating, the Task Force helps the community negotiate with those who control potential receiving areas so that the relocating community gains the right to live on the new land. The new site must be approved by 60% of those in the relocating community. The Task Force assists with funding and guiding the relocation process and conducts monitoring and evaluation after the relocation. This presentation considers what aspects of the Fijian model could work in the United States.

📢 Speakers



Virginie Duvat UMR LIENSs 7266

Alexandre Magnan Senior Research fellow IDDRI (Sciences Po, France)

Carol Farbotko ARC Future Fellow

Griffith University

Celia McMichael The University of Melbourne

Barrett Ristroph Owner

Ristroph Law, Planning, and Research

10:30 AM

15A) Pluvial flooding: Addressing the Risks of Heavy Rainfall

10:30 AM - 12:00 PM, Jun 23

Pluvial flooding occurs when extreme rainfall events exceed the capacity of drainage systems and can occur far from the coast but is compounded by sea level rise and storm surge in coastal areas. The risks from this type of flooding are increasing in many areas as extreme rainfall events increase in frequency and duration; however, it is often not as well understood or communicated to the public. Existing flood maps typically only communicate coastal and riverine flood risks, while mitigating pluvial flood risk also proves challenging. Despite the considerable challenges, cities are taking on the responsibility of communicating and mitigating pluvial flood risk. Several cities have developed their own risk maps and are beginning outreach regarding the limitations of existing and future infrastructure, and the responsibilities borne by private property owners. While bigger pipes and pumps might be part of the solution, there are significant technical and economic limitations. Similarly, funding for these investments often requires increasing water or stormwater charges and securing Federal dollars. Increasingly, cities are also looking to nature-based solutions in addition to traditional infrastructure, and to the past-to understand where the functions of the pre-development landscape might be a cue for future mitigation, and potentially buyouts. This session will explore the challenges posed by pluvial flooding and solutions that are being explored to understand, communicate, and mitigate the increasing risks faced locally and across the globe.

Speakers

Alan Cohn

Managing Director, Integrated Water Management NYC DEP

Amy Chester

Managing Director Rebuild By Design

Angela Licata

Deputy Commissioner for Sustainability NYC DEP



Dr. Eric Sanderson Vice President for Urban Conservation New York Botanical Garden

15B) New Data and Methods in Modelling Sea-Level Rise-Related Adaptation and **Migration Decisions** 10:30 AM - 12:00 PM, Jun 23

Global sea-level rise will affect coastal environments through permanent inundation, saltwater intrusion into soils and coastal aquifers, coastal erosion, and flooding due to extreme sea levels. Coastal communities will likely respond to these environmental changes by pursuing adaptation strategies: they may choose to implement local measures such as flood protection, or they may choose to adapt through managed or unmanaged migration. These adaptation decisions are made on different decision levels, with, for example, households flood-proofing their homes, or governments engaging in property buyout schemes. Currently there is a growing research interest to model these decisions in response to sea-level rise and to evaluate migration as an adaptation strategy against other adaptation options. However, the spatial scale often determines how these adaptation decisions are captured in such modeling efforts. On the larger regional to continental scales, gravity models are often applied to simulate aggregate migration flows. In local to national studies, descriptive analysis, agent-based models and surveys focus on the decision-making process of individuals and households. There is a research need to bridge the gap between these top-down and bottom-up approaches, integrating insights from local studies to inform and validate larger scale modelling efforts. Such work may also include the use of statistical or machine learning techniques for upscaling such local insights to regional to global scales.

Therefore, this session pursues three aims: a) to take stock the current state-of-the-art data and methods in simulating human adaptation and migration behavior in response to sea level rise at different spatial scales; b) to discuss the strengths and weaknesses of these methods in capturing human decision-making; and c) to reflect on how to couple existing social- and physical-science approaches in future research. Addressing these aims will help to improve existing adaptation and migration modeling efforts, thereby leading to more informed coastal decision-making in the context of adaptation planning when using the results of such modeling efforts.

Session Chairs: Lena Reimann, Postdoctoral Researcher, Vrije Universiteit Amsterdam; Lars Tierolf, PhD Researcher, Vrije Universiteit Amsterdam; Wouter Botzen, Professor, Vrije Universiteit Amsterdam; Jeroen Aerts, Professor, Vrije Universiteit Amsterdam

Drivers of migration behavior under increased flood risk from sea-level rise: A cross-national study

Sem Duijndam, PhD candidate, VU University Amsterdam

DYNAMO-M: A global agent-based model of adaptation and migration decisions in face of sea level rise

· Lars Tierolf, PhD candidate, Institute for Environmental Studies, VU University

Implications of global vs. local data for understanding populations at risk of seaward hazards and adaptation planning

• Deborah Balk, Professor, CUNY Institute for Demographic Research

Using agent-based modelling to explore pre-inundation impacts of sea-level rise in Bangladesh delta

• Roland Smith, Leverhulme Trust Doctoral Scholar at the University of East Anglia (UEA) and Tyndall Centre for Climate Change (presenting)

• Robert J. Nicholls, School of Environmental Sciences and Tyndall Centre for Climate Change Research, University of East Anglia (UEA)

• Mark G. L. Tebboth, School of International Development and Tyndall Centre for Climate Change Research, University of East Anglia (UEA)

Avidan Kent, School of Law, University of East Anglia (UEA) and Tyndall Centre for Climate Change Research

Data and communication challenges in co-producing knowledge for migration and adaptation under uncertain futures

• Andrew Bell, Assistant Professor, Earth and Environment, Boston University (presenting)

• Nic Choquette-Levy, Postdoctoral Researcher, Boston University

 Fabien Cottier, Postdoctoral Research Scientist, Center for International Earth Science Information Network, Columbia Climate School

• Alex de Sherbinin, Senior Research Scientist and Deputy Director, CIESIN, Columbia Climate School

Forced coastal migration due to 21st century sea-level rise induced land loss under cost-benefit optimal coastal protection

• Daniel Lincke, Global Climate Forum, Germany (presenting)

• Jochen Hinkel, Division of Resource Economics, Albrecht Daniel Thaer-Institute and Berlin Workshop in Institutional Analysis of Social-Ecological Systems (WINS), Humboldt-University

📢 Speakers



Sem Duijndam

VU University Amsterdam



Lars Tierolf

Institute for Environmental Studies, VU University, De Boelelaan 1087, 1081 HV Amsterdam, the Netherlands;



Deborah Balk

Professor CUNY Institute for Demographic Resaerch



Roland Smith University of East Anglia



Andrew Bell Assistant Professor, Earth and Environment Boston University



Daniel Lincke Global Climate Forum, Germany



Lena Reimann Postdoctoral researcher Vrije Universiteit Amsterdam

15C) Putting Retreat into Context: Housing and Infrastructure in Flood-Prone Areas

I0:30 AM - 12:00 PM, Jun 23

Most of what we know about managed retreat has come from contexts where infrastructure and housing development has occurred in hazardous areas, damages from extreme events have mounted, and communities have subsequently incorporated retreat into portfolios of flood risk reduction. We know much less about the other pathway for keeping people and infrastructure out of harm's way: communities that have grown without developing housing and infrastructure in floodplains in the first place, where needs for retreat are more targeted or even non-existent at present.

This session will reflect on how and why some communities are able to avoid developing housing and infrastructure in flood-prone areas. We will report on new systematic, nationwide measurements of municipal floodplain development. These measures combine remote-sensing capacities and data science tools to answer long-standing questions about where development is taking place in communities across the United States. The measures will be open access once completed. Based on these novel floodplain-development measures, we will discuss how municipalities have successfully limited development in the floodplain, including social, economic, and geographic factors, the law and policy tools that are relevant for both avoidance and retreat, and lessons learned across cases. In this way, the session will situate retreat into the broader contexts of land-use planning, affordable housing development, and flood risk management—where successes have been historically missed and may have much to teach us.

Perspectives in the session will combine both research and practice, spanning from federal agencies to local government. The exchanges will be question driven and lively.

Speakers

Director, Climate Change Science & Policy Hub University of Delaware



Katharine Mach

Professor University of Miami



Miyuki Hino

Assistant Professor University of North Carolina Chapel Hill

15D) Resettlement and Planned Relocation in the Global South

I0:30 AM - 12:00 PM, Jun 23

Equity and risk tradeoffs of managed retreat from volcanic hazard: Mt. Merapi, Indonesia

• Brent Doberstein, Associate Professor, University of Waterloo Department of Geography and Environmental Management (presenting)

Beth Palmer, Research Associate, University of Waterloo Department of Geography and Environmental Management

Knowledge and implementation gaps for inclusive and equitable relocation practice as assessed by researchers and practitioners

• David Durand-Delacre, Senior Researcher, UNU-EHS

The role of relocation in the context of limits of adaptation to climate change - A case study in the Salkantay catchment in the Peruvian Andes

- Isabel Hagen, PhD candidate, University of Zurich (presenting)
- Christian Huggel, University of Zurich
- Sanne Schnyder, University of Zurich
- Inés Yanac León, Wayintsik
- Sirkku Juhola, University of Helsinki
- Veruska Muccione, University of Zurich

Speakers

Brent Doberstein

Associate Professor University of Waterloo

David Durand-Delacre Senior Researcher UNU-EHS



1:30 PM

16A) Displacement in NYC: Making Space for Our Neighbors (2) 1:30 PM - 3:00 PM, Jun 23

Speakers

Amy Chester Managing Director Rebuild By Design Marco Tedesco

Marco Tedesco Lamont Research Professor Columbia University

16B) Relocation and Transporation Infrastructure

I:30 PM - 3:00 PM, Jun 23

On the Edge of Something Big - San Diego's \$3 Billion Project to Relocate a Railroad off Coastal Bluffs

· Laura Walsh, California Policy Manager, Surfrider Foundation

Going Off the Rails with Climate Change: How Railroad Closures Along California's Coast are Impacting Equity, Land Management, the Economy, and Recreation—and the Solutions at the End of the Tunnel

• Stefanie Sekich, Sr. Manager, Coasts and Climate Initiative, Surfrider Foundation (presenting)

• Laura Walsh, California Policy Manager, Surfrider Foundation

The Port Authority of NY & NJ's Approach to Addressing Complex Infrastructure Interdependencies

Josh DeFlorio, Chief, Resilience & Sustainability, Port Authority of NY & NJ

Considering Climigration in Transportation Infrastructure Investments in Receiving Communities

• Allie Reilly, Lead Consultant, Climate, Resilience, and Sustainability, WSP USA (presenting)

Catherine Prince, Director, Climate, Resilience, and Sustainability, WSP USA

Speakers



Laura Walsh California Policy Manager Surfrider Foundation

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Stefanie Sekich Sr. Manager, Coasts and Climate Initiative Surfrider Foundation

Josh DeFlorio





Allie Reilly Lead Consultant, Climate, Resilience, and Sustainability WSP USA

16C) Ecosystems and Managed Retreat (2) 1:30 PM - 3:00 PM, Jun 23

Co-adaptation- Pairing the Relocation of Plant and Animal Species with Human Resettlement

- Jared Enriquez, University at Albany, SUNY (presenting)
- · Lijo Varghese, NY Department of Environmental Conservation
- Tyler Bobko, Student, University at Albany

Managed Retreat and Wetland Migration: Vulnerability Interactions Between Moving People and Wetlands

· Celina Balderas Guzman, Assistant Professor, University of Washington

Legal mechanisms for managed retreat of coastal wetlands: an Australian perspective

· Justine Bell-James, Associate Professor, University of Queensland

Strategic Retreat and Nature: Untapped Role for Conservation Organizations

- Alyssa Mann, Climate Resilience Project Director, The Nature Conservancy (presenting)
- · Olivia Won, University of California Santa Cruz
- Piper Wallingford, The Nature Conservancy
- · Walter Heady, The Nature Conservancy

The social dimensions of managed realignment of agricultural dykes and restoration of tidal wetlands on the Bay of Fundy coast

- Kate Sherren, Professor, Dalhousie University (presenting)
- Brandon Champagne, MA Student, Department of Geography and Environmental Studies, Saint Mary's University
- Yan Chen, PhD candidate, School for Resource and Environmental Studies, Dalhousie University
- · Lara Cornejo, Postdoctoral fellow, School for Resource and Environmental Studies, Dalhousie University
- Isabel Cotton, PhD candidate, Tyndall Centre for Climate Change, University of East Anglia
- · Samantha Howard, PhD candidate, School for Resource and Environmental Studies, Dalhousie University
- Paria Movaghati Nashta, MES student, School for Resource and Environmental Studies, Dalhousie University

 Kara Pictou, Community-based Monitoring Coordinator, Department of Environment and Natural Resources, Confederacy of Mainland Mi'kmaq

- Emily Wells, MES student, School for Resource and Environmental Studies, Dalhousie University
- · Danika van Proosdij, Professor, Department of Geography and Environmental Studies, Saint Mary's University
- · Qiqi Zhao, PhD candidate, School of Geography and Ocean Science, Nanjing University

Speakers

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Jared Enriquez University at Albany, SUNY

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Celina Balderas Guzman

Assistant Professor University of Washington

Justine Bell-james

Associate Professor University Of Queensland



Alyssa Mann Climate Resilience Project Director The Nature Conservancy



Kate Sherren Full Professor

School for Resource and Environmental Studies, Dalhousie University

16D) Climate and Social Science for Managed Retreat

1:30 PM - 3:00 PM, Jun 23

Atoll Habitability Thresholds

• Mark Stege, Maloelap Atoll Local Government (presenting)

• Michael B. Gerrard, Andrew Sabin Professor of Professional Practice and Director, Sabin Center for Climate Change Law, Columbia Law School

Benjamin Orlove, Professor, School of International and Public Affairs and Senior Research Scientist, Columbia
University

• Jon Barnett, Australian Research Council Laureate Fellow, School of Geography, Earth and Atmospheric Sciences Faculty of Science, The University of Melbourne

Using hyperlocal experiential data to amplify community voice in retreat, migration, and relocation decisions

• Julia Kumari Drapkin, CEO, ISeeChange (presenting)

Derek Kauneckis, ISeeChange / The Desert Research Institute Senior Resilience Analyst and Services Lead /
Associate Research Professor

Traditional Ecological Knowledge in targeting a culturally meaningful retreat in the Arctic

• Jaimlyn Sypniewski, PhD candidate, Oregon State University (presenting)

• Jamon Van Den Hoek, Associate Professor of Geography in the College of Earth, Ocean, and Atmospheric Sciences, Oregon State University

Anthropocene im-mobilities: exploring the materiality of 'thick time.'

Giovanna Gini, PhD candidate, Queen Mary University of London

Coastal Adaptation Pathways - The case of Folly Beach, South Carolina

• Tess Doeffinger, Postdoctoral researcher, University of Delaware
Speakers



Mark Stege Maloelap Atoll Local Government



Julia Kumari Drapkin

CEO ISeeChange



Jaimlyn Sypniewski PhD Student Oregon State University

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Giovanna Gini PhD student Queen Mary University of London



Tess Doeffinger Postdoctoral Research Fellow University of Delaware