

Adaptation Initiative Reading Seminar #1
Re-Greening of the Sahel
Thursday, October 26, 2017
Leader: Alessandra Giannini

Summary of papers

Herrmann, Anyamba and Tucker, 2005, Recent trends in vegetation dynamics in the African Sahel and their relationship to climate, *Global Environmental Change*

The droughts in the Sahelian region in the late 1960s through the 1980s were unprecedented in their length and impact. Since the 1980s, there has been an increase in greenness over large areas of the Sahel, though not uniformly. This paper looks at the pattern of and relationship between vegetation greenness and rainfall variability in the African Sahel. This study uses the Normalized Difference Vegetation Index (NDVI) as a proxy for vegetation greenness and gridded satellite precipitation estimates as a proxy for rainfall, and looks at data between 1982 and 2003.

The overall trend in monthly maximum NDVI is positive over a large portion of the Sahel region in the time period, and is accompanied by widespread increases in rainfall. The results confirm that vegetation greenness in semi-arid environments is more strongly related to rainfall over a period of time, than to instantaneous rainfall. However, there are also areas in which the vegetation has been greening up more than expected by rainfall alone – ‘positive hot spots’ – as well as areas that show negative trends, where greening has fallen behind what would be expected from the increase in rainfall.

Overall, positive trends in NDVI indicate a net increase in biomass production between 1983-2003, challenging the notion of irreversible desertification in the Sahel. While rainfall is the dominant reason for the increase in vegetation greenness, the authors state there is evidence of another, human-caused change, though field studies are required in order to show causes at the local level. Human-induced factors include changes in land use, exploitation of natural resources, production strategies and conservation efforts.

Reij, Tappan and Belemvire, 2005, Changing land management practices and vegetation on the Central Plateau of Burkina Faso (1968-2002), *Journal of Arid Environments*

Farmers, governments and NGOs started to experiment with improving soil and water conservation (SWC) techniques in the early 1980s in the northern part of the central plateau of Burkina Faso, following a series of drought years. Between 1968-2002, the total investment in SWC techniques has been about 200 million USD. While some say that the environment continues to degrade, others note significant improvements in yields.

This study looked at the impact of SWC investments in nine villages between 1968 and 2002 and identified a number of impacts, including: increased yields in millet and sorghum which means improved household food security; greater availability of forage for livestock; more cash available to invest in livestock; rising ground water tables; population growth; and decrease in rural poverty. Areas not treated with SWC techniques continue to degrade. In sum, the technological change in SWC in the early 1980s helped trigger a process of agricultural intensification.

DISCUSSION

Context for the papers

While climate scientists were debating causes of drought, things were actually happening on the ground. The Reij paper looks at local action, how people reacted to narratives that linked drought and desertification to local human activity, and aspects of local knowledge to remedy land degradation that were improved upon and used. The Herrmann paper looks at the issue from a more regional perspective. Now that we know that drought was not caused by local human activity, rather by changes in the climate system at scales much larger than the Sahel, can the Reij paper be re-read to provide a way forward for adaptation to climate change in the end? Interventions to combat land degradation make better and more efficient use of rainfall, so these could be ways to respond to greater variability in precipitation. Climate affects land cover, and there is feedback.

Scientists hypothesized that the Sahelian droughts of the 70s and 80s were caused by mismanagement of land resources (cutting trees, etc. that persisted drought and reduced precipitation). The correct explanation is that the droughts were caused by large-scale changes in sea surface temperatures. But to what extent can we attribute these effects to global climate changes, specifically to anthropogenic emissions [of greenhouse gases and aerosols]?

The core issue that these papers bring up: What can we do to adapt? How big of a role can human interventions play in something that has such big drivers in decadal variability? What can we say to continue to captivate people to adapt? How are responses taken up in some places and not in others? Where do they work, where could they work? And what should people adapt to – mean changes in precipitation, or changes in the sub-seasonal distribution of rains, including dry spells and drought?

It took a long time to recover from the droughts, so when all of a sudden we see something different – greening – it is difficult to know what to attribute this to. The global system, or the local adaptation measures? Maybe it's a combination of both, but it is not easy to disentangle. You would want intelligent greening anyway (for both mitigation, adaptation, co-benefits, cooling, etc.).

Adaptation

Mitigation is global but adaptation is local. We need to consider what humans do in different places. There are many examples in history where things happen, humans adapt, and sometimes it is successful and sometimes not.

There is also a scale issue. Climate projections are happening at the regional or global scale, while adaptation is at the local scale, rooted in immediate experiences. One example – most projections for the southwest US talk about enduring drought, and communities are worried about water scarcity. Then there were floods and we were completely unprepared, and had not even considered from a planning/policy perspective that the opposite may happen.

Adaptation is really up to local municipalities. Sometimes there is not local capacity because there's no legacy planning. Cities are cash strapped and don't have money for everything. In polls, people care more about things like education and health than climate change.

Climate can't be forgotten. For example, there has been a lot of investment in REDD and within less than 10 years, Brazil has seen a huge drought and related fires, which released almost all of the carbon that was claimed to have been stored through REDD. If at the same time, they were also preparing for widespread fires, those impacts would have been mitigated and they would have not lost all the gains through the program. Climate needs to be part of the thinking, but it is only one piece of the puzzle. Adaptation is a multi-disciplinary problem.

There is also a question of how the communities themselves play a role in adaptation, or how they understand. It is an overwhelming concept for the general public. We don't necessarily make it easy for them, nor are the communities included in planning and conversation. Climate services is one piece that tries to address this.

Using Science for Policy

What is the role of climate science? We have to understand the nature of the variability and trends in different locations, and also have some sense of attribution. The cause determines what we can do. These two papers bring this issue to the forefront. There is so much variability; at the local scale, this variability doesn't always mean something for adaptation in practice. There is then a question of how to reconcile local experiences and narratives with large scale trends. There are nuances in policy and law, and you don't always have all the expertise that you need around the table.

By studying the climate, we can improve on our resilience. But the information delivered to non-scientists should be slightly different. Policy makers often want to know what exactly is the technical adaptation. But there is enough uncertainty that we cannot prescribe something specific, though we keep telling people that we will someday know. Climate has become taboo in government.

Policy prescriptions are largely not changed by the nuances of the natural sciences predictions. Sometimes it is too overwhelming for policy makers to be given so much data, and being asked to respond to this much data. Slight changes might or might not improve policy outcomes.

But there are also two different policy streams: reactive policy and resiliency planning. More dynamic and nimble policies and frameworks that can allow people to better prepare, and can build resilience to the point that makes sense. There is also a question of who uses the science, and how it gets institutionally into the system, trickled to the local level responses.

In Syria, there was a 3 year drought which created a shift in population, and the government didn't do the right thing. Perhaps they didn't know if it was something that would pass. We have to understand WHY a problem is caused. This is a case where climate projections would have been very useful.

Then we have structural policy – things like early warning and early action systems, that are based on vulnerable populations. These types of structural approaches to providing more security in a climate insecure future don't necessarily need narrow projections. Donors are willing to give money for climate related actions and projects. How do you convince them that early warning systems are actually adaptation to climate change?

Migration

We don't recognize some of the adaptation strategies that people have, including migration. There is a signal between drought and out-migration. Was out migration an issue in the 70s and 80s in this region? And are people going back?

In the case of Senegal, there was lots of out migration to Europe in the 70s and 80s. People in the northern Sahelian region of Senegal are less vulnerable to climate; they rely heavily on remittances. There is a culture of migration (pastoralists) and they already faced it. In the wetter southeast of Senegal, there was no intervention because they didn't reach points of famine and migration. Adaptive capacity indicators are very low there (no roads, health centers, low education levels, etc.). Tend to not out-migrate because they are not used to it, so vulnerability to climate is much higher.

Are climate change migrants treated differently from other migrants, and can we meaningfully separate them? Climate refugees vs economic refugees – they are all intertwined and is difficult to say with accuracy that someone is a climate refugee versus a political refugee, for example.

Adaptation Initiative Reading Seminar #2
Wildfire: Climate, Settlement, Forests, Fire Management
Thursday, November 9, 2017
Leader: Richard Seager

Summary of papers

Bowman et al., 2017. Human exposure and sensitivity to globally extreme wildfire events. *Nature Ecology and Evolution*

This paper reports that economically or socially disastrous extreme wildfires are concentrated in suburban areas intermixed with flammable forest in the developed world. Regional land use can reduce the occurrence of fire disasters. Climate change is likely to increase the frequency of extreme wildfires. The paper notes the pivotal role of meteorological conditions in driving extreme wildfire events, signaling increased global vulnerability to these events with climate change.

Fischer et al., 2016, Wildfire risk as a socioecological pathology. *The Ecological Society of America*

Wildfire risk is increasing on a global scale, causing huge economic loss; nevertheless, fire is an essential ecological process. The authors define this as a socioecological pathology: a set of interrelated social and ecological conditions and processes that deviate from what is healthy/desirable. The authors use a coupled natural and human systems (CNHS) perspective to understand the pathology of wildfire risk in fire-prone temperate forests and suggest strategies to mitigate it. Finding solutions requires paying more attention to the interplay between social and ecological conditions and processes that influence human decision-making (wildfire governance system).

Moritz et al., 2014, Learning to coexist with wildfire. *Nature*

Policy strategies to address wildfires often emphasize fuel reduction; the authors state that viewing fire in the context of socioecological systems (SESs), recognizing the link between human and natural environments, provides insights into achieving a more sustainable coexistence with wildfire. This paper summarizes research on fire-prone ecosystems and fire effects on human communities through the lens of SESs. The authors suggest that context-specific and place-based approaches will be needed, and that greater attention to land-use planning is warranted.

DISCUSSION

Fire with respect to humans and human settlement is a problem that is becoming more intense in many regions of the world, especially semi-arid regions like the Western U.S., Australia, and the Mediterranean. Climate change makes the potential for fire worse, for simple physical reasons. Climate models predict vapor pressure deficit to increase (defined as the difference in moisture between what the air has and what it could hold). Ecosystems and people do adjust to an overall drier mean climate. Extreme variability plays a role but everything else held equal, a warmer world should have more fire.

Climate modeling is also dependent on dynamic vegetation models; it is unclear how vegetation will look in the future. In the Northern Mediterranean, there seems to be an increase in fire that is occurring because of agricultural land abandonment. Change in land use and revegetation causes an increase in fuel.

The ultimate challenge is to adapt to fire, allow it to happen and lessen the problem. We have to stop putting out fires, but how do we incentivize this?

Fire Modeling Limitations

Our ability to model fire and project it in the future is still pretty poor. There are not long records of global fire data. The Bowman paper only has 15 years of data. Future predictions require a lot of parameterization. We still infer a lot about future patterns; we are not yet modeling the actual sequence of events. The models are overly simple.

In addition, parcel level data doesn't exist. Some solutions may require this level of data to assess risk and prescribe solutions. We need parcel level data as a first step, and improved modeling. Then we would have information to make these decisions. But one issue is that the parcel is always changing based on its surroundings. Good, high-resolution fire spread models that update dynamically as landscape changes would be very useful, but we are nowhere close to this.

Legacy in the U.S.

Within the U.S. (Fig. 1 Fischer), fire was a normal part of most ecosystems prior to European-American interference in the late 1800s. Much of the interference was passive at first, largely due to reductions in fuels due to grazing of cattle and sheep. In 1910, a series of enormous forest fires worried the U.S. government that repeated years with giant fires could put the country's timber resources at risk. Trees were viewed essentially as a monetary resource, critical for housing, mining, railroads, etc. To protect these resources, the U.S. Forest Service adopted the ambitious and idealistic policy of suppressing all newly discovered forest fires by 10am the next day. The policy reflected complete intolerance of fire. This transformed western U.S. forests over the following several decades, as the suppression fires allowed fuels to build up, particularly in the understory. Today's forests reflect this history, with large loads of fuels in the understory that serve as "ladder fuels" for fires to transition from low-severity fires that burn along the forest floor to high-severity crown fires that spread through the canopies of trees and kill the trees along the way.

These transitions, first to a near-elimination of fire over a century ago, and now to large, high-severity fires, are today evident in tree ring records. When surface fires burn through a forest, large trees generally do not die but their tree trunks are scarred the scars are preserved in the tree-ring record. While these scars are common in tree-ring records prior to the late 1800s, it is difficult to find stumps with evidence of a fire in the past century. In recent decades, we have seen a resurgence of fire occurrence in western U.S. forests, but many of these fires have been so intense that large swaths of forests have been burned entirely. Despite the tree-ring evidence of common, low-intensity fire being a normal component of forest ecosystems throughout much of the U.S., and knowledge now that our interference has not only led to an unnatural ecological setting but has also contributed to the transition toward large, intense, and unmanageable forest fires that we see today, we still attempt to suppress the vast majority of fires, and usually successfully, actively perpetuating the problem into the hands of future generations.

Federal costs of fire suppression have grown to be approximately \$2 billion annually. The Forest Service fire budget is based on the 10 year average; more than half the budget is firefighting. The U.S. taxpayer bears the cost.

Even though there are huge areas of public lands where fires originate, the assets of value and infrastructure at risk are in private lands. The idea of fire as a coupled natural-human system has become popular, as fire critically affects human systems and human systems critically affect fire. Local governments are very interested in mitigating fire risk (they bear the cost of fires), but land owners generally don't want to be told what to do. Despite the public's desire for autonomy, surveys show that the public generally views wildfire management as the job of the government. Public education is key to addressing the unsustainable approach to fire management in western U.S. forests, but funding for public education is not prioritized above funding for fire suppression, representing one way in which the western U.S. fire problem is self-propagating.

Insurance and Other Protective Measures

With fires, the insurance dynamic is tricky. Most insurance companies do not do aggressive work on wildfire because it doesn't touch their bottom line. Their biggest cost for home insurance is hail. Hail happens multiple times per year and causes extensive property damage. Wildfire is catastrophic but rarer.

There are certain things you can do to protect your home. There are several nonprofits that work with homeowners to help them. But for people who own a lot of property, these measures are incredibly expensive and won't guarantee 100% protection. These measures reduce risk but do not eliminate it. Insurance companies are slowly starting to offer rate reductions for people who do defensible actions.

Fire is a part of normal homeowner insurance programs (not so with floods). There are some rumors that insurers are threatening to back out of writing policy for fire. Some properties are uninsurable at any rate. It could become like flood insurance, with the government subsidizing it leading to political disaster. When private insurers stopped writing policy for floods, government took over and NFIP was created. However, it is likely very far away for fire insurance since fires aren't putting insurers out of business. But if fires grow faster and become more frequent, this could change.

Is there such thing as a fire easement? For example, NYC has regulatory authority over watersheds and drinking water sources, and there are voluntary conservation easements within private land owners so they don't use land within a certain buffer zone. This incentivizes them to take on measures that they otherwise wouldn't, for the public benefit. There are programs like this with fire – financial assistance, management plan assistance, but still all voluntary.

Fires, Floods and Retreat

With floods, rebuilding is the high cost. With fire, the big cost is firefighting. We try and stop fires, but don't try and stop floods. Another difference is that when you rebuild in a fire zone, there's no high risk anymore until the vegetation recovers; in flood zones, the risk remains. Post-Sandy, a couple of communities in Staten Island were bought out – even one that was moved to a different location. But what are the secondary consequences of retreat vis a vis tax rates, schools, etc.? Buy-out is complicated and doesn't happen much.

What about a tax or fee for living in a higher risk place? This wouldn't work for fire, because that parcel level data doesn't exist, and you can't show that one particular house or piece of land corresponds to a specific risk ranking. Home builders and realtors are very much against this.

Human nature is to rebuild, not to retreat. More and more people want to live in these wild-urban interface areas (amenity-seeking migrants). Strategic retreat is not discussed in relationship to fire. People don't want to move and have an attachment to place.

Adaptation Initiative Reading Seminar #3
 Legal Issues in Managed Coastal Retreat
 Thursday, November 16, 2017
 Leader: Michael Gerrard

Managed Coastal Retreat: A Legal Handbook of Shifting Development Away from Vulnerable Areas, Columbia Law School, Center for Climate Change Law, 2013:
https://web.law.columbia.edu/sites/default/files/microsites/climate-change/files/Publications/ManagedCoastalRetreat_FINAL_Oct%2030.pdf

Climate change has already impacted our coastlines in the U.S. Rising sea-level and more frequent storms threaten our infrastructure and homes. Tough decisions need to be made to move this infrastructure away from the coasts. A long-term policy of managed retreat can limit a community’s exposure to coastal hazards, save lives and limit public funding expenditures on vulnerable infrastructure. This Handbook contains examples and case studies from early innovators, and raises key legal issues. It provides practical advice drawn from examples of places where managed retreat has already been conducted or is ongoing. Managed retreat has been done before, and we can learn from those cases.

Table 1. Adaptation of the Build Environment to Sea Level Rise: Spectrum of Legal Responses – Retreat to Defend (Source: Michael Gerrard)

Description	Example
Retreat	
Remove existing uses that are vulnerable	Conditions in CA’s Coastal Comm. Permits
Plan for relocation when needed	Kivalina v. ExxonMobil; Kiribati
Ban reconstruction of existing uses	Arlington v. Texas General Land Office; nonconforming uses
Disinvest in infrastructure	But: Jordan v. St. John’s County (Fla. Dist. Ct. App. 2011).
Allow only temporary uses	Tahoe-Sierra v. Tahoe Regional (US 2002)
Ban shoreline protection, beach nourishment	CA Coastal Commission; some rolling easements; New South Wales towns
Ban new uses in hazard area	Lucas v. SC Coastal Council
Inhibit financing of new uses in hazard area	(Ban mortgages from federally-insured banks)
Substantive limitations, e.g. buffers, setbacks	Nollan, Dolan
Procedural hurdles	(Require EISs in hazard areas)
Voluntary buybacks	NY, NJ after Sandy
Financial disincentives for development	National Flood Insurance Program [not]
Consideration and disclosure	CEQ’s NEPA guidelines [revoked]
Do nothing; allow shoreline to migrate inland; do not protect or relocate	NEUTRALITY Most places
Accommodate: Require new uses to be resilient	Some post-Sandy reconstruction and NYC building code revisions
Require public infrastructure to take sea level rise into account	Con Edison; NYC Third Water Tunnel; Boston’s Deer Island POTW
Publicly funded nourishment of eroded beaches	Stop the Beach Renourishment v. Florida DEP
Rock/concrete groins to restrain sand	Long Island’s north and south shores
Raise land elevation for new development	Willetts Point, Queens
Sea walls and levees	Netherlands; Japan; New Orleans (failed); lower Manhattan (eventually)
Sea barriers	Thames
Rebuild destroyed areas that continue to be vulnerable	New Orleans
Defend	

DISCUSSION

Managed retreat has mostly been discussed in the context of coastlines. There is no managed retreat policy anywhere in the world. 9 key questions that need to be addressed in setting up a managed retreat policy:

1. Retreat from where? What degree of probability and severity of hazards would justify retreat? What are habitability thresholds, and do those thresholds differ culturally?
2. When retreat? Do you retreat only after a disaster hits, or do you do it before?
3. Retreat voluntary or forced? Do people have a choice, do you ask or tell? Is it done on an individual household or community basis?
4. Retreat total or partial? Entire area, or will some uses remain? If applied, is it applied to everything or damaged structures?
5. Retreat to where? Are the places that receive people, do they have to consent? How important is it that the receiving area can support the same level of livability? Does the government use eminent domain? Should places be pre-designated as receiving zones?
6. In order to avoid retreat, what degree of adaptation will be carried out? (Ex: hard armoring of coastlines)
7. Who decides all of this? How much agency do individuals and family have?
8. What kind of compensation is provided to displace property owners? Is buyout at pre-disaster value or post-disaster value? Is the compensation enough for people to buy a new house or relocate a business?
9. Who pays? General federal taxpayer revenue; state and local governments?

See *table 1* for a list of various kinds of legal mechanisms that exist, on a spectrum from *retreat* to *defend*. There is no coherent policy at all anywhere, and there are many dueling legal incentives.

Relocation or retreat by itself sounds dramatic. But if it is one piece of a general adaptation strategy, looking simultaneously at other steps or alternatives, maybe giving some greater context can provide a different view of retreat. Retreat does not stand alone by itself.

There hasn't yet been planned retreat in the context of sea level rise, but governments have moved people. What lessons might be learned from these cases? Are those cases analogous to this? Monetary compensation isn't enough. Where to move and what happens with receiving communities – this is understudied and isn't addressed properly. We do have population movements going to big metropolitan areas, so can you create incentives to attract people to new places?

Retreat is a moral hazard that isn't priced accurately with insurance. We are talking about anywhere between 2-6 million homes that could be inundated due to sea level rise. The amount of money we would need to address that number is feasible. But we do need an accurate costing analysis of the impacts of climate change effects – not just homes, but also infrastructure, environmental contamination, livelihood impacts, lives lost, etc.

Community-Driven Migration

Retreat has worked when the community wants to get together and be relocated. So how can communities organize themselves or be organized, even if there is no initial consensus? [Oakwood Beach in Staten Island](#) is one example. The community was flooded for decades, and inundated various times. When Sandy came along, they went to Assemblymen in Albany, and convinced the Governor to set funds aside for their relocation. They essentially organized themselves to be bought out. The relocation covered a couple of blocks. The Governor's Office of Storm Recovery acquired 299 homes for a cost of \$122 million. This community model worked because

it wasn't just a one-time event. It was a discussion that happened over time, since they basically lived in a marsh that would be flooded anytime there was heavy rainfall.

This kind of voluntary buyout is unsustainable at the scale needed. The number of households that are highly vulnerable is in the millions. People should never have built in marshes or wetlands, but they have and still do. How can we get disincentives? It is difficult, especially in the United States where individual property is so important. The kind of compensation you would need is very high.

Another example of bottom-up community organization comes from the cleanup of [Long Island Sound](#), where several communities formed a consortia to cut down nitrogen. The communities came together for the purpose of protecting the sound, after a disaster in 1987.

Socioeconomic Issues

Both rich and poor live near the waterfront, but this brings another set of issues. Social fairness is different than incentive structure. In theory, pricing insurance can lead to a number for an incentive. Wealthier people might be first movers because they have the access to information, means, etc. In solutions, we need to consider what the income distribution is of people who may need to move, as well as who is owning versus renting.

Risk and Decision-Making

Rational decision making doesn't necessarily take into account sea level rise or other types of risk. One type of policy is to require disclosure. [California](#) has this for geological hazards and fault lines, so there is precedence. But disclosure becomes bottomless. Even the most knowledgeable people buy the property anyway, and go in regardless of the type of disclosure. It's a policy tool that can be better developed that might provide information. You need really accurate mapping and data at the parcel level.

The description of risk often comes up short. Tying property and value to coastal ecosystem loss may be helpful. Letting people know the other things that will be impacted – ecosystem, wildlife, etc., gives a larger picture. Otherwise everything just seems like a financial transaction. For example, in [Oakwood Beach](#), there is a plan to turn that area into a park. While there was extreme loss for the community, this still provides opportunity for growth of ecological systems. This helps frame retreat in a less negative way.

Examples

- In [New York State](#), large numbers were moved in the Catskills, as late as the 1960s.
- [Houston, Texas](#) is a textbook case, showing the contention between private rights and regulatory taking.
- There was lots of damage during Sandy in the [Howard Beach, Broad Channel](#) community, but people have come back, houses elevated. It is a working class, tightly knit community, with lots of city employees (firefighters, policeman, etc.). Housing is affordable and the neighborhood is beautiful. It's a unique part of NYC, and there's no way a community like that is going to be created somewhere else. The connection that people have with communities is strong – they live 3, 4 generations in the same place. People here will not want to move.
- In [Louisiana](#), there was contamination of land where people lived, which is covered under superfund law, so there is legal precedent when it comes to hazardous waste contamination.
- In California, [San Francisco and Oakland](#) have filed law suits against fossil fuel companies to help them pay for sea walls.

- In the [South Florida Keys and other low-lying areas](#), it is not hard to imagine a scenario where people can't get of the area if there isn't enough warning before a hurricane. There is a huge public safety risk and potential for immediate loss of life during the event.

Managed and Unmanaged Retreat

In our current system, how could we actually do this on large scale? It has only been done on a small scale, in specific contexts. The scale of the block is a manageable scale for the concept of retreat. Not quite a city or neighborhood, but still a cluster of people that can make collective action or decision. HUD has a block grant program – can we work this backwards? American mentality is all about incentives.

Land use and zoning are municipal government decisions, so there are lots of different approaches within one city, and then how do you link that to federal funding? What kind of story telling would push the narrative in government, and create coalitions of support for a national approach? How does the law need to change in order to cope with the climate to come?

The alternative to managed retreat is unmanaged retreat. We could envision a situation where sea level rise gets to be so great – property values decrease, NFIP doesn't work, federal bailouts will not be enough. Or, managed retreat on a crisis basis, on the level of large scale eminent domain, where it is done quickly. The planning exercise and the conversation is different in these different situations. It is hard to imagine that the government could ever do this on a large scale. Ad hoc sequential crises are the most likely scenario, and also the model for what is happening now. [New Orleans](#) is an example of this – the population has dropped quite a bit, but there is still rebuilding happening.

Further Reading

- Dahl, Spanger-Siegfried, Caldas (2017), Effective inundation of continental United States communities with 21st century sea level rise, <https://www.elementascience.org/articles/10.1525/elementa.234/> (includes socioeconomic analysis of persons affected by sea level rise)
- Hauer, Evans and Mishra (2016), Millions projected to be at risk from sea-level rise in the continental United States, *Nature Climate Change*, <https://www.nature.com/articles/nclimate2961>
- Lessons From Hurricane Harvey: Houston's Struggle Is America's Tale, *New York Times*, https://www.nytimes.com/interactive/2017/11/11/climate/houston-flooding-climate.html?_r=0
- Kim Stanley Robinson, New York 2140, <https://www.amazon.com/New-York-2140-Stanley-Robinson/dp/031626234X>
- Tom Anderson, This Fine Piece of Water, An Environmental History of Long Island Sound, <https://yalebooks.yale.edu/book/9780300102871/fine-piece-water>
- Trevor Houser et al., Economic Risks of Climate Change <https://cup.columbia.edu/book/economic-risks-of-climate-change/9780231174565>
- Eric Kaufman and Joaquin Matias, A Call to Action: How to Save Millions of Lives <https://www.amazon.com/Call-Action-Save-Millions-Lives/dp/1545220549>
- Risky Business, The Bottom Line on Climate Change <https://riskybusiness.org/>

Adaptation Initiative Reading Seminar #4
Retreat Resettlement Issues
Thursday, November 30, 2017
Leader: Alex de Sherbinin

SUMMARY OF PAPERS

Hino, Field and Mach., 2017, Managed retreat as a response to natural hazard risk, *Nature Climate Change*

This paper evaluates cases of managed retreat that have resettled around 1.3 million people over the past three decades. The conceptual model developed establishes a foundation for understanding and anticipating case-specific complexities. The model identifies key sociopolitical attributes likely to promote or impede adoption of managed retreat. The model categorizes the cases into four groups: mutual agreement; greater good; hunkered down; and self reliance. For example, the 'mutual agreement' group is where residents initiative the move, and there are broader society benefits. In this group, place attachment and community networks strongly affect the final outcome, and has largely been limited to post-disaster settings. The goal is for this model to help evaluate if and how to implement managed retreat.

Maldonado et al., 2013, The impact of climate change on tribal communities in the U.S., *Climate Change*

Communities that face greater likelihood of relocation are also often those that have experienced systemic poverty and injustice. This paper looks at communities' advocacy efforts and strategies in dealing with climate change, displacement and relocation, looking specifically at tribal communities in Coastal Alaska and Louisiana. The cases point to a number of legal and policy implications. There is no government agency tasked with managing community relocation. Federal programs that do exist to help communities prepare for disasters are unavailable to many tribal communities because of their small size and remote location.

The precedent set by the Resettlement Administration in the U.S. could help inform the framework needed. In that case, there were dedicated resources towards successful community relocations and the resettlements were most successful when community input and participation was integrated and supported. The authors make recommendations on steps for community-led and government-supported resettlement programs. They call for management and planning through participatory processes and according to communities' needs and priorities. Protocols that guide this framework should be rooted in a human rights approach.

Oliver-Smith and de Sherbinin, 2014, Resettlement in the twenty-first century, *Crisis*

Resettlement/planned relocation has a poor track record, due to lack of inputs such as legal frameworks, policies, funding and care. Resettlement also requires a complex interaction of cultural, social, environmental, economic, institutional and political factors that are not conducive to rational planning. When it comes to preventive resettlement, it is difficult to muster political will and resources in absence of a major disaster, even in areas with a high probability of disaster. The authors conclude by

stating that: “a key element to improvement in resettlement practice will be the recognition that the displaced must be seen as active social agents of their own views and rights on entitlements.”

DISCUSSION

Planned relocation is not just about moving people from A to B. It is a complicated problem that involves a lot of different factors. It involves reconstituting the social fabric of a community, if that is even possible. Development forced displacement and resettlement has a checkered history, but the experience of disaster-related resettlement has produced marginally better results. Stressed migration is to be avoided, where people have to move suddenly with very few possessions. We try to anticipate, but that is difficult. Human rights need to be considered. Participatory approaches lead to better results. There also needs to be clear lines of governmental authority and responsibility, and adequate funding.

There may be many cases that could theoretically be deemed relocation that are never recorded as such. Examples could include where people move voluntarily or don't move to a place because of some piece of information about the risk of being there (that's not necessarily recorded as climate driven). There are others who would leave if they could, but the buyout money is gone and asset values have dropped, leaving them stranded—especially if their mortgage debt is greater than the home's price.

With resettlement, you need economic incentives, and enough social upheaval that people welcome government intervention. But those economic incentives will be different in each context, different for each economic group, different for receiving communities, etc. Each situation is unique. It would be difficult to find an economic incentive big enough to move someone elsewhere, especially pre-disaster.

The risks that people care about are much more immediate – for example, people who live in high-crime neighborhoods. Are they not eligible for relocation? They are also facing risk. From public policy perspective, how do you allocate resources and determine eligibility? Could a program be criticized for focusing on climate and climate change risk at the exclusion of other risks?

The Role of Intermediaries

One aspect of successful resettlement may be working with intermediaries, in whatever form (NGO, CBO, etc.). There is not much research on their role or impact, but there are a couple of examples.

In Istanbul, some resettlement occurred after a 1999 earthquake that killed 17,000 people. The government used intermediaries – agencies of engineering consulting firms – to assess risk at people's property. Community members received a report of the risk, which could then lead to resettlement or rebuilding. People felt empowered because they felt they had a choice.

In Ghana in the 1960s, there was resettlement of an area led by an architect. This movement was framed as a positive thing for the poor people of the valley.

Examples of Resettlement

- Hohai University has a resettlement research center; China has lots of investment in training.
- There's an example where the community took control of the process, associated with the Parana Dam between Brazil and Paraguay.
- Correa wrote a volume that looks at a lot of cases of disaster displacement, mostly in Latin America

- 1930s, Roosevelt created a number of communities in the South.
- Many examples of tribes in Alaska, but that ultimately did not happen.
- Malcolm Gladwell piece about the people who left New Orleans and who were essentially doing better.
- Dustbowl migration – many people who left ended up gainfully employed in west coast industries. Government also encouraged land management practices.

Retreat to Where?

We need more research on this aspect of resettlement. Could this be tied to driving economic growth? With public and private sector participation, could we frame this as an economic positive? There is lots of potential in repopulating depopulated cities, like Detroit. People would need to be employed, but you could create jobs building solar panels, improving the energy efficiency of homes and buildings, greening public transportation, etc. Rather than build a new city, repopulate an existing one.

Matt Hauer at the University of Georgia (?) leads the Institute of Government's Applied Demography Program, which provides state and local leaders with current demographic data and detailed population projections. He has done some work using tax records to see where people have moved in the past and using this as a predictor of where they may move in the future. This data set, though contains flaws, is one of the few of its kind.

In Europe, there were some ideas about repopulating villages with conflict refugees. But the refugees didn't want to go to those areas because of lack of economic opportunities. Climate relocation would depend on economic opportunities, and how much the economic activity is dependent on climate. For example, in the case of desertification of the Sahel, people lose their livelihoods. Coastal areas in Sierra Leone are under pressure from erosion, but people are not leaving because they are dependent on fishing to make a living – this is the area where their economic livelihood is.

Is Pre-Disaster Resettlement Possible?

Pre disaster and post disaster resettlement involve very different exercises. All of the 'mutual agreement' cases in the Hino paper are post disaster. Are there any examples in the world of resettlement happening pre-disaster? Can policies be changed in such a way that government agencies can put aside funds to do something pre-disaster?

You could have anticipatory settlement, but if governments are corrupt it could become a pretext for land grabs. What could be seen as a legitimate humanitarian exercise could be co-opted. Further, if people are forced to move pre-disaster and predictions are wrong, the credibility of this exercise is diminished. It's difficult to get people to do anything in advance of a disaster – some might say a waste of time. We are not a rational species. There are not many examples where society does something in advance/ in anticipation. One thing that *can* be done in advance is designating receiving areas and policy mechanisms for such transfers, since we know there will be disasters, even if we are not sure exactly where.

What can the Earth Institute do?

1. There is a lot of interest in Puerto Rico, and there may be a project or activity that involves building back in a less fragile way. This is somewhat connected to relocation. Will people want to go back after living on the mainland, especially if recovery is slow?

2. Lead communication efforts to articulate some of the challenges and the importance of having these conversations. The information and communication needs to be in a time scale within which we can do something about it.
3. Analysis or scenario building of future climate impacts, to anticipate where retreat may be required.

Conclusion

People move back to places after disasters. People in California move back to homes after earthquakes, even to houses built on the fault lines. In Houston it is very likely that rebuilding will happen in exactly the same place. Even in NYC, where there is a tremendous amount of climate risk awareness, there is still development in these high risk areas. We're not leading the way on this. There is probably some arrogance – we have the money to build the barriers, etc. Everyone underestimates how much they will be impacted by climate change.

The idea of resettlement is not that we are forcing people to move. But it is important to have a response policy in place for when resettlement is necessary. Part of this includes having a strategy to engage communications and media outlets, when the disaster happens. Locally, people are amenable to discussing risk and vulnerability around the time that disasters happen. We shouldn't shy away from having sophisticated media campaigns after disasters. Even though some people view it as profiteering, we should try and reach people when their eyes are open.

APPENDIX – HANDOUT

Economic and Social Risks of Displacement and Resettlement

1. Loss of land
2. Loss of employment
3. Loss of shelter
4. Marginalization (reduced economic mobility)
5. Increased morbidity and mortality
6. Greater food insecurity
7. Loss of access to common property/services
8. Social disarticulation (break-up of community organizations and other groups)

Source: Cernea, M., 2000. Risks, Safeguards, and Reconstruction: A Model for Population Displacement and Resettlement. The World Bank.

Four Stage Process (lessons from resettlement associated with large dams)

1. Planning for resettlement prior to physical removal
2. Coping with the initial drop in living standards that tends to follow removal
3. Initiation of economic development and community formation activities that are necessary to improve living standards of first generation resettlers
4. Handing over a sustainable resettlement process to the second generation of resettlers and to non-project authority institutions

Source: Scudder T (1985) A Sociological Framework for the Analysis of New Lands Settlements. In: Cernea MM (ed) *Putting People First: Sociological Variables in Rural Development*. Oxford University Press for the World Bank, New York, pp 145–185

Recommendations for Climate-Related Resettlement

1. Establish legal frameworks for climate change resettlement to protect welfare and human rights of affected populations
2. Involvement of affected communities, in both source and destination areas, in assessments and decisions regarding resettlement locations, compensation, and development programs
3. The process needs to be fair and equitable for the community, with every effort made to improve livelihoods
4. Interdisciplinary training for resettlement professionals that includes economics, anthropology, public health, and case studies
5. Baseline environmental, health, and social impact assessments to establish benchmarks for evaluating resettlement performance through monitoring and evaluation programs
6. Research to adapt existing knowledge on resettlement to the special case of climate related resettlement, with particular reference to disaster-related resettlement and learning from incipient climate-related resettlement
7. Establishment of financial mechanisms for capacity building and anticipatory planning in developing countries exposed most to climate risks, with joint funding by donors and the exposed countries themselves, since many M&A projects will not generate revenues that could offset costs.

Source: de Sherbinin, A., M. Castro, F. Gemenne, M.M. Cernea, S. Adamo, P. M. Fearnside, G. Krieger, S. Lahmani, A. Oliver-Smith, A. Pankhurst, T. Scudder, B. Singer, Y. Tan, G. Wannier, P. Boncour, C. Ehrhart, G. Hugo, B. Pandey, G. Shi. 2011. Preparing for Resettlement Associated with Climate Change. *Science*, 28 October 2011, 334: 456-457.