Natural Hazards Observer

Volume XL · Number 4

April 2016

Climate Change and Indigenous People

Merging Traditional Knowledge and Western Science

By Karletta Chief and Alison Meadow

Barriers to Tribal Mitigation Planning

By Lucy Carter and Lori Peek

Building Bridges Between Scientific and Indigenous Communities

By Heather Lazrus, Bob Gough, and Julie Maldonado

Looking Through the Lens of Environmental Justice

By Stacia Ryder

The mission of the Natural Hazards Center is to advance and communicate knowledge on hazards mitigation and disaster preparedness, response, and recovery. Using an all-hazards and interdisciplinary framework, the Center fosters information sharing and integration of activities among researchers, practitioners, and policy makers from around the world; supports and conducts research; and provides educational opportunities for the next generation of hazards scholars and professionals. The Natural Hazards Center is funded through a National Science Foundation grant and supplemented by contributions from a consortium of federal agencies and nonprofit organizations dedicated to reducing vulnerability to disasters.

Observer cartoons are drawn by Rob Pudim.

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On the Cover

Photographer, documentary video producer & educator Phil Daquila documented life in Newtok Alaska in 2009. You can find more of his stunning photographs on page 26

WELCOME TO THE April 2016 issue of the *Natural Hazards Observer*, dedicated to climate change and indigenous people in the United States.

Indigenous communities in our country—from Native Americans in Louisiana and Pacific Islanders in Hawaii to Alaska Natives in the Arctic Circle—face a myriad of climate change impacts that threaten to undermine their livelihoods, identity, and culture. Key impacts include drought and decreased water availability, thinning arctic sea ice, thawing permafrost, erosion, and floods. In turn, these impacts can lead to food insecurity and, in some cases such as Newtok Alaska and Isle de Jean Charles in Louisiana, it even leads to the need to relocate.

These impacts are compounded by persistent socioeconomical issues, such a lack of health and community services, insufficient infrastructure, transportation and education; high unemployment; and substandard and inadequate housing.

According to Bennett et al. (2014), the overwhelming driver of these adverse social indicators is pervasive poverty. The average poverty rate on reservations and in Native communities is 28.4 percent (compared to 15.3 nationally). This widespread poverty is responsible for a number of other problems, such as a high homeless rate on reservations and a lack of electricity, running water, and modern telecommunications (Internet access and phone service).

In their chapter, which was published in the National Climate Assessment report "Our Changing Climate," Bennett et al. also point out that native populations are especially vulnerable to climate change because "their physical, mental, intellectual, social, and cultural well-being is traditionally tied to a close relationship with the natural world, and because of their dependence on the land and resources for basic needs such as medicine, shelter, and food."

This close relationship, however, also works in the favor of tribal communities. Traditional knowledge of their environment and natural resources can inform adaptation and sustainability strategies.

In the past decade, Western scientists have begun to value the complementary role of traditional knowledge in climate change assessments. The 2007 Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report recognized that "traditional knowledge of local communities represents an important, yet currently largely under-used resource for climate change, impacts, adaptation and vulnerability assessment" (IPCC, 2007).

Since then, there have been some important initiatives where scientists have worked closely with indigenous communities and merged traditional knowledge and western-based approaches to address climate change and related impacts. The Alaska Native Tribal Health Consortium, for example, works with a network of local environmental observers and topic experts who apply traditional knowledge, western science, and technology to the documentation of environmental and ecological changes in their communities. The purpose of this network is to increase understanding about their changing communities so they can adapt in a timely manner (Alaska Native Tribal Health Consortium, 2016).

Two articles, one written by Karletta Chief and Alison Meadow from the University of Arizona and another by Heather Lazrus, Julie Maldonado, and Bob Gough from the The Rising Voices program, discuss a number of other successful collaborations between scientists and indigenous communities. According to the authors, trust and respect are the keys to the success of these cross-cultural collaborations.

To establish the necessary trust and mutual respect, indigenous scientists, such as Karletta Chief of the Navajo Nation in Arizona, can play important roles. Unfortunately, as discussed by Lazrus et al., there is an absence of indigenous leaders in atmospheric sciences, decision-making, and policy efforts. To address this demographic deficit, Rising Voices has called on 2015 UN Climate Summit participants to create a Climate Change Service Corps to support youth from indigenous and non-indigenous backgrounds to work with communities and with scientists to find climate solutions. Capacity would be enhanced through mentorships, scholarships, and internships with federal agencies.

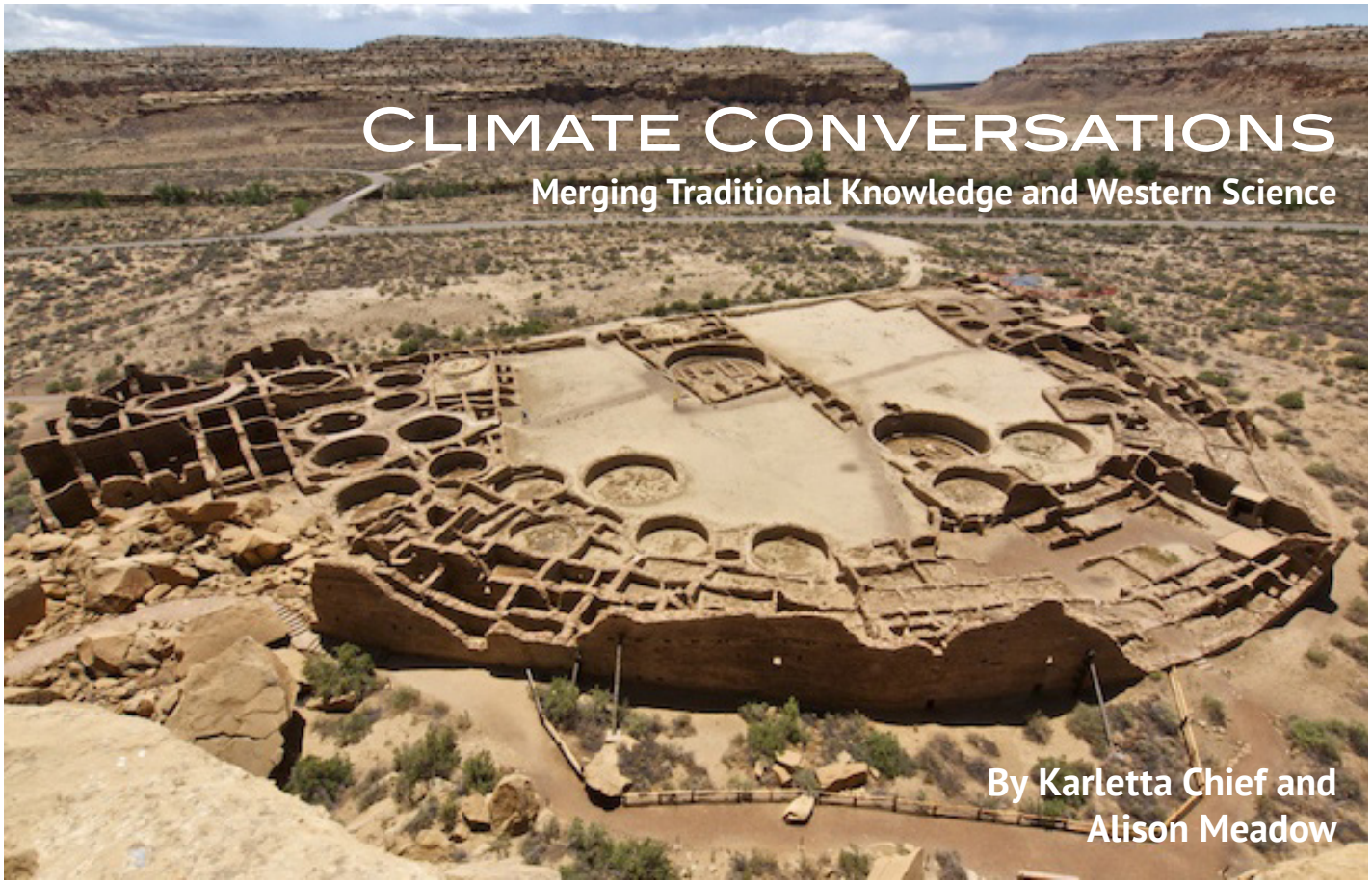
Two other articles in this issue discuss some of the hurdles that tribal communities are faced with in disaster planning, mitigation, and response. Lucy Carter and Lori Peek assess the levels of mitigation planning and engagement among Native American and Alaska Native tribes. My article about Newtok, an Alaskan town that is on the verge of being swept away, explores the village relocation efforts in the past two decades and the many obstacles to obtaining funding for these efforts.

On another note, author Stacia Ryder looks at technological accidents and environmental hazards through a social justice lens. She analyzes the uneven attention and level of government response, accountability, and effectiveness in communities—indigenous and non-indigenous—harmed by disasters. These include lead contamination in Flint and the Gold King mine spill on the San Juan River, which contaminated the Navajo Nation's primary irrigation source with arsenic, cadmium, and lead.

This issue's articles show that State and federal government agencies continue to struggle to identify and respond to the immediate needs of vulnerable communities— such as Newtok, Navajo Nation, Isle de Jean Charles, and Flint—threatened or struck by climate induced or other man-made disasters. While the U.S. government has made important strides to working with such communities, there is still room for improvement.

Enjoy your Observer!

Elke Weesjes, Editor



Climate Conversations

Merging Traditional Knowledge and Western Science

By Karletta Chief and Alison Meadow

Pueblo Bonito - New Mexico © Sam Wise. The Anasazi built magnificent villages such as Chaco Canyon's Pueblo Bonito, a tenth-century complex. They successfully adapted to drier conditions and short intense thunderstorms during 900 and 1000 A.D. by introducing techniques of deep planting of seeds and technological innovation of water control structures and methods such as use of terraces to utilize runoff

CLIMATE CHANGE is a hazard that will affect—and in fact already is affecting—communities around the world. It is a particularly damaging hazard for indigenous communities because of a combination of political and economic factors that have left them socio-economically vulnerable, and because climate change puts at risk the intimate relationships indigenous people maintain with their physical environments. Indigenous communities' cultures, traditions and in some cases their very identities are based on the land and the sacred places that shape their world. Their respect for their ancestors and Mother Earth speaks of a unique value system different from some commonly held Western values, for example Christianity or Judaism.

As researchers, we would like to show how universities can play an important role in helping indigenous communities, namely Native American tribes, better understand and adapt to climate change. For instance, these institutions and their scientists can provide climate information, such as paleo-climate records, instrumental climate data, and climate model projections as well as tools for adaptation planning. However, it is critical that such information and tools be developed in collaboration with the communities themselves; they are the ones who will live with both the climate impacts and the adaptation decisions. In this article, we, at the University of Arizona (UA) Haury Native Nations Climate Adaptation Program (NNCAP) at the Center for Climate Adaptation Solutions, describe our experiences working with several Native American communities to meet their needs for climate information and support their efforts in planning for climate-change adaptation. In addition, having Native American perspectives is helpful in ensuring cultural sensitivities when working with tribes—Dr. Karletta Chief, Assistant Professor, is from the Navajo Nation in Arizona and the Project Coordinator of the NNAP, Mr. Chad Marchand is from the Coville Confederated Tribes of Washington.

Power of partnerships

Native American tribes are resilient; they have successfully adapted over time to environmental and ecological change through diversification of food and other resources, innovation of new technology, rich local knowledge about the area, and migration. For example, the Anasazi people adapted to drier conditions and short intense thunderstorms during 900 and 1000 A.D. in the Southwest by introducing techniques of deep planting of seeds and technological innovation of water control structures and methods such as use of terraces to utilize runoff (Baugh, 1994; Binman, 2008; Ben-David et al. 1974). The wisdom gathered through centuries of observations and passed down through generations provides a wealth of knowledge to

contribute to effective adaptation strategies, such as earth-sheltered homes that use the earth for insulation, dry land farming, and use of drought resilient native seeds. However, only recently Western scientists have begun to place equal value on the traditional knowledge of tribes—for example, as a way to inform development of sustainable technologies or corroborate scientific data (Hiza, et al., 2014; Berkes 1998; Gearheard et al. 2010). Hiza Redsteer et al. (2014) interviewed Navajo elders regarding local environmental observations which were validated by scientific data but it also provided an extension of data to understand physical dimensions in the environment which were otherwise unobtainable (Hiza Redsteer et al., 2014). Many Native American tribes have practiced sustainable ways of living that is often community based and participatory that only recently has become more valuable by non-tribal people in climate mitigation and adaption. The integration of traditional knowledge into climate initiatives is promising. However, researchers wishing to integrate such knowledge into climate adaptation work must be aware of the potential risks that indigenous peoples face in sharing traditional knowledge and be aware of ethical protocols required to ensure the protection of traditional knowledge (Climate Change Working Group, 2013).

Since traditional knowledge is increasingly recognized, federal agencies and national climate change initiatives are funding collaborative efforts between indigenous communities and federal and non-indigenous climate change entities that involve traditional knowledge. In response to this, a large group of indigenous persons, staff of indigenous governments and organizations, and experts with experience working with issues concerning traditional knowledge developed guidelines on considering traditional knowledge in climate initiatives. Their goal was to establish guidelines so that non-indigenous centers and agencies can understand that the ultimate authority rests with the individual tribe and knowledge holders in whether or not to share traditional knowledge. Each tribe has their own unique authority for traditional knowledge, how the knowledge is transferred through time and space, and who may hold that knowledge. These guidelines were meant to inspire dialogue and questions, and to foster opportunities for indigenous peoples and non-indigenous partners to weave traditional knowledge and western science in culturally appropriate ways. Two key rules of ethical engagement are 1) ensure that researchers have obtained free, prior and informed consent from the community and 2) cause no harm. Tribes are sovereign nations who have the right to freely participate or disengage, and to fully know how their knowledge will be applied (Lomawaima 2000; Sahota 2007). An additional component of ethical engagement is the responsibility of researchers and their community partners to determine how to appropriately apply traditional knowledge to the question at hand (Ford et al. 2015; Huntington 2005).

UA has a rich history of strong partnerships with tribes as well as a strong expertise in climate science and adaptation. Recently, the Native Nations Climate Adaptation Program (NNCAP) was developed by the Center for Climate Adaptation Science and Solutions (CCASS) within the Institute of the Environment at UA to work with tribes on climate adaptation. Through the examples of two projects, we discuss in this article the challenges and successes of working with tribes on climate adaptation and risk-management plans. The foundation for successfully working with tribes is built on a history of previous tribal university partnerships that were nurtured through the years both by the researchers and their collaborators working in tribal government and natural resource management. These experienced boundary spanners (those who actively bridge the gap between research and practice) apply an engaged approach to provide science support for tribes while following tribal research protocols and abiding by the ethical protocols.

Building trust with tribal communities includes open and consistent communication (in-person whenever feasible), transparency or process, and reporting results back. Because tribes may be approached by different researchers from different institutions, it is critical that we use our network to leverage existing efforts and avoid duplication. Building capacity of tribes includes recruiting Native American students to work on these projects and training them with the intent that they will work for their tribe at the completion of the academic pursuits in some capacity. In fact, NNCAP's program coordinator is Native American and has a record of successful tribal engagement.

Two projects

The first project is a drought study with the Hopi Tribe, whose lands are located in the Four Corners region of the American Southwest, roughly at the intersection of Utah, Arizona, New Mexico, and Colorado. The Hopi Department of Natural Resources (HDNR) has been collaborating with UA researchers to develop a drought-monitoring framework to help HDNR address the drought impacts, such as to farming, ranching, and cultural traditions, that resource managers note have affected them for at least 15 years. The framework was developed using a collaborative research approach that included rapid assessment, organizational ethnography, and participant observation, as well as interviews and multiple discussions with Hopi citizens and employees over approximately five years. The goal of the project was to ensure that Hopi people's concerns about drought, existing monitoring and knowledge practices, and capacity to respond to drought impacts were are the forefront of the effort.

By relying on local knowledge and skills the drought-monitoring framework is designed to harness local data in ways that support local decisions, rather than relying entirely on instrumental data from external sources, which is sparse across Hopi lands. For example, the team noted that the current drought plan relied on data not readily accessible to HDNR staff, making it difficult to declare (or undeclare) drought. However, HDNR staff members were already collecting environmental status information through several programs, including water resources and range management that shed ample light on drought con-

Four Young Hopi women grinding grain © Edward S. Curtis 1906

Alandra Duyongwa of the Hopi Tribe 2013 © Speaker John Boehner

ditions in the region. The shift to locally controlled data, the team hopes, will place more control in the hands of local decision-makers and community members who are most affected by drought impacts (Ferguson et al. in review).

The second project involves the Pyramid Lake Paiute Tribe (PLPT). Researchers from UA, University of Nevada Las Vegas, and the U.S. Geological Survey have been collaborating with the PLPT in Nevada to identify vulnerabilities to climate change. When interviewed (by one of the authors, Alison Meadow) about their experiences working together, both the researchers and the tribal staff discussed important practices when researchers collaborate with tribes, particularly on sensitive issues involving water and water rights.

For example, although the PLPT does not have its own research review board, the lead investigator (author Karletta Chief) ensured that she had the support and consent of the tribal council by formally requesting their cooperation in the project. Also, she received a letter of support from the (then) tribal chairman that documented her permission to undertake the research and the tribe's commitment to collaborating with her team. Throughout the project, the research team checked with PLPT staff to ensure that they were following community protocols regarding meetings, interviews, or other forms of data-gathering. They worked with PLPT staff to organize community meeting to ensure that local protocols were followed. A high degree of trust developed between the researchers and PLPT staff, which was demonstrated when the potentially sensitive issue of protected cultural knowledge came up in the course of the research. Rather than become a hurdle, both groups were able to discuss what to do with cultural knowledge, should it arise in interviews or other discussions, and come to an understanding.

Tribal Leaders Summit on Climate Change

In December 2015, CCCAS and NNCAP hosted the first Tribal Leaders Summit on Climate Change: A Focus on Climate Adaptation Planning and Implementation. It was held at the University of Arizona in Tucson, Ariz., on November 12 and 13, 2015. The Summit aimed to convene tribal environmental managers and leaders who have approved climate adaptation plans to share experiences, lessons learned, and build support for wider tribal climate-adaptation planning and implementation work. Sixty people attended the Summit, including 20 tribal representatives from at least 19 tribes (including two tribal council women from the Village of Newtok, Alaska), 10 federal agency representatives, and 20 university representatives and students. In general, the tribal summit participants reflected very positively about the Tribal Summit (n=14; 9 tribal; 1 academic; 1 government; 1 other; 3 unknown/ did not select a category). More respondents thought that the highlights and interest portions of the summit were the case studies of planning/implementation and the traditional knowledge discussions. Traditional knowledge was widely discussed. One participant observed:
"We have always adapted using traditional knowledge. The challenge now is to record it and integrate western science into our adaptation. We also need to help the rest of the world understand our knowledge and priorities" (Black et.al, 2015).

Some participants noted weaknesses in the Summit, however. For instance, they said, the breakout sessions were repetitive and should have had more native facilitators. Some complained that they wanted the Summit to include some topics that weren't covered, such as energy and economic sustainability. The participants suggested that the Summit in the future include activities to facilitate internal partnerships within tribes and engagement of citizens to translate the concept of climate change. By communicating climate change to local context, communities can "acknowledge what's there and empower people to deal with it" (Black at.al, 2015). Another suggestion was to link existing plans (like hazard mitigation or drought plans) with adaptation plans helps to overcome resistance. One theme that arose was the importance of monitoring

and evaluating the success of implementation activities to facilitate improvement.

Building blocks for the future

This is a good starting point for NNCAP, suggesting potential to build upon these successful partnerships. We are currently developing tools such as a climate-adaptation profile that can provide tribes with the basic climate information necessary to start the adaptation-planning process—namely, analysis of past climate, current trends, and projected future climate. The next step in this process is to develop training materials for climate-adaptation planning that focus on the climate impacts and responses that are most relevant for each individual tribe. We are also continuing to train Native American students in climate-adaptation planning and climate science. In order to understand the needs of tribes, we are currently conducting a tribal adaptation needs assessment for tribes in the Southwest. The assessment will help us understand where tribes are in the process of climate adaptation, what their information and support needs are, and how we can develop culturally appropriate tools for climate adaptation. We have developed regional partnerships with other climate centers such as the Department of the Interior Southwest Climate Science Center and the National Oceanic and Atmospheric Administration-funded Climate Assessment for the Southwest (CLIMAS), which we hope will help us extend our capacity and reach to provide additional on-the-ground support for tribal climate adaptation efforts.

We would like to acknowledge Mary Black, Kathy Jacobs, Dan Ferguson, and Chad Marchand for their contributions in developing the framework of this article.

REFERENCES

Baugh, T. 1994. "The Origins of Southwestern Agriculture" *The American Indian Quarterly* 21 Apr. 2016.

Ben-David, S., F.L. Brown Jr., W.D. Schulze, and J.E. Zamora. 1974. Water as a limiting factor in Indian economic development. Technical completion report, Project No. 3109-125, New Mexico Water Resources Research Institute.

Berkes, F. 1998. "Indigeous knowledge and resource management systems in the Canadian subarctic" *Linking Social and Ecological Systems: Management Practices and Social Mechanisms for Building Resilience*, F. Berkes, and C. Folke, Eds., Cambridge University Press, 98-128.

Black, M., K. Chief, K. Jacobs., S. Chew, and L. Rae. 2016. Native Nations Climate Adaptations Program Tribal Leaders Summit on Climate Change: A focus on climate adaptation planning and implementation. University of Arizona, Tucson, AZ, November 12-13, 2015.

Ferguson, D. B., A. Masayesva, A. M. Meadow, and M. A. Crimmins, in review: "Rain gauges to range conditions: Developing a local drought information system using locally relevant observations" Ford, J. D., E. Stephenson, A.C. Willox, V. Edge, K. Farahbakhsh, C. Furgal, S. Harper, S. Chatwood, I. Mauro, T. Pearce, S. Austin, A. Bunce, A. Bussalleu, J. Diaz, K. Finner, A. Gordon, C. Huet, K. Kitching, M. Lardeau, G. McDowell, E. McDonald, L. Nakoneczny and M. Sherman. 2016. *Community-based adaptation research in the Canadian Arctic.* Wiley Interdisciplinary Reviews: Climate Change, 7:175–191.

Gearheard, S., M. Pocernich, R. Stewart, J. Sanguya, and H. P. Huntington. 2010. "Linking Inuit knowledge and meteorological station observations to understand changing wind patters at Clyde River, Nunavut". *Climatic Change*, 100, 267-294.

Hiza Redsteer, M.H., K.B. Kelley, H. Francis, and D. Block. 2014. "Increasing Vulnerability of the Navajo People to Drought and Climate Change in the southwestern United States: Accounts from Tribal Elders." *Indigenous Knowledge for Climate Change Assessment and Adaptation*, Edition: In Press, Publisher: Cambridge University Press, Editors: Douglas Nakashima, Jennifer Rubis, Igor Krupnik.

Huntington, H. P. 2005. "We Dance Around in a Ring and Suppose: Academic Engagement with Traditional Knowledge" *Arct. Anthropol.*, 42, 29-32.

Lomawaima, K. T. 2000. "Tribal Sovereigns: Reframing Research in American Indian Education" *Harvard Educational Review*, 70.

Sahota, P. C. 2007. Research Regulation in American Indian/Alaska Native Communities: Policy and Practice Considerations.

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Dishchii' Bikoh' Apache Group from Cibecue, Arizona © Grand Canyon National Park

Participation Please

Barriers to Tribal Mitigation Planning

By Lucy Carter and Lori Peek

AMERICAN INDIAN and Alaska Native tribes have made strides in terms of working with the U.S. government to plan for disaster. However, participation rates in mitigation program remain quite low, especially in some of the most disaster prone regions of the nation.

The passing of the 2013 Sandy Recovery Act granted tribes the ability to bypass States and request a disaster declaration from the President as an autonomous government. On March 1, 2013, the first tribal disaster declaration request made directly to the President was granted to the Eastern Band of Cherokee Indians in North Carolina. More than 300 members of the tribe were affected by torrential rain, severe flooding, and landslides, and damages totaled more than $5.4 million. In a press release, Federal Emergency Management Agency (FEMA) official Michael Bolch stated, "this is the first time the Federal Government has worked one-on-one in partnership with a tribal government following a disaster… It is a truly historic moment." The declaration triggered $3.3 million in federal assistance, of which $1.3 million was contingent on the tribe having a disaster plan in effect.

In contrast, the Cheyenne River Sioux tribe of South Dakota experienced six major disasters since 2008, including several severe storms, blizzards, and heavy snowfall. Even with this recent history of disasters, the tribe does not currently have an approved disaster plan, making them ineligible for crucial federal mitigation project funding.

The experience of the Cheyenne River Sioux tribe is not unusual. As of September 30, 2015, only 117 of 566[1] federally recognized tribes had FEMA-approved disaster mitigation plans. This means that more than three-quarters of all tribes are ineligible to apply for FEMA grants and cannot receive federal funding for disaster mitigation projects. In light of the increasing number of climate-induced disasters and the fact that Native communities are more socially and economically vulnerable to disaster than others, it is vital to strengthen voluntary participation in tribal disaster mitigation efforts.

Considering the urgency of the problem, there are remarkably few investigations into how American Indian and Alaska Native disaster policy has been formed and developed. While a few publications are available on the importance of tribal sovereignty in disaster (see Adams, 2012; and Leemon, 2014), little attention is devoted to disaster mitigation planning among tribes or to the ways that tribes apply for federal assistance after an event.

The research presented in this article, which draws on Carter (2016), attempts to fill this void and summarizes a comprehensive policy analysis that included the review of 66 federal documents focusing on disaster mitigation and American Indian tribal sovereignty. In addition, we analyzed FEMA tribal disaster declaration data and tribal mitigation planning data so we could assess the level of mitigation planning and engagement among American Indian and Alaska Native (AIAN) tribes.

Vulnerabilities

Scholars of social vulnerability and disaster have long recognized that socially and economically marginalized racial and ethnic minorities experience higher levels of risk and loss (Fothergill et al., 1999; Dash, 2013). Although much of the literature focuses on the two largest racial and ethnic minority groups in the United States—African Americans and Latinos—there is growing recognition that American Indians and Alaska Natives might also face special risks in disaster because of the intersection of economic, demo-

1While there are currently 567 federally recognized tribes in the United States, in this article we report on the status of the 566 tribes included in the FEMA dataset we acquired for analysis for this project.

graphic, physical, and cultural factors.

Consider the following: In 2015, 28.3 percent of AIAN individuals lived below the poverty line, which is more than twice the national average. Educational attainment among this population is among the lowest in the nation. Native American youth are more likely to drop out of high school than any other racial or ethnic group in the United States. According to a 2012 report from the U.S. Interagency Council on Homelessness, although only 1.2 percent of the national population identifies as AIAN, 4 percent of all sheltered homeless persons and 4.8 percent of all sheltered homeless families self-identify as Native American or Alaska Native. The same report revealed that nearly one in five people (19 percent) on tribal lands are living in conditions considered "overcrowded" and much of that housing is lacking basic plumbing and kitchen facilities (also see Fogarty, 2004). Native Americans suffer from chronic and acute illnesses such as diabetes, heart disease, and tuberculosis at rates up to 600 percent higher than the national average. They also have substance-abuse rates that far exceed the national average with American Indian individuals 510 percent more likely to suffer from alcoholism. Additionally, they are twice as likely as any other racial group to die before the age of 24—with suicide being the second highest cause of death for 15-24 year olds (Horowitz, 2014).

These vulnerability indicators are exacerbated by more frequent and intense disaster threats in tribal areas. In the past four decades, 120 disasters have affected tribal areas, according to FEMA disaster declaration records.[2] The number of disasters has increased steadily over time, and 2010-2016 had the most tribal disasters on record (see Figure 1).

The most common type of disaster experienced by tribes is severe storms, accounting for 59 of the 120 disaster declarations since 1976.[3]

Tribal areas have also been routinely affected by floods and fires, as well as several other natural hazards (see Table 1).

Sandy Recovery Improvement Act

Programs under the authority of FEMA, such as their Hazard Mitigation Grant Program, Public Assistance, and Pre-Disaster Mitigation project funding, are the key mechanisms through which tribes may receive technical and financial assistance for mitigating hazards. However, until recently, tribes were unable to request a disaster declaration as a grantee. Instead, the governor of their state had to request a declaration on their behalf. Tribes had the option to request a disaster declaration as a sub-grantee, but some deemed this process a violation of tribal sovereignty.4 After all, the ability to self-govern and to protect and enhance the health, safety, and welfare of tribal citizens within a tribal territory is essential to the concept of tribal sovereignty (Leemon, 2014).

The status of tribes changed in 2013 when the Sandy Recovery Improvement Act was passed, which ultimately led to the amendment of the 1988 Robert T. Stafford Act. The amendment recognized tribes as distinct from local governments and gave tribes a direct channel to request a presidential disaster declaration. Since then, seven tribes have used this method, side-stepping states in the process.

As mentioned above, the first tribe to apply directly for federal disaster assistance was the Eastern Band of the Cherokee Nation. The tribe requested a disaster declara-

2 Data retrieved from https://www.fema.gov/data-visualization on November 15, 2015. FEMA and the Federal Government cannot vouch for the data or analyses derived from these data after the data have been retrieved from the Agency's website(s) and/or Data.gov.

3 1976 was the first year a tribal disaster incident triggered a disaster declaration.

4 Under U.S. law, federally recognized tribes are considered domestic dependent nations who are not under the jurisdiction of states. The ability for tribes to govern and protect may be jeopardized if a state government is able to block the disaster mitigation process by breaking the direct line to government that tribal sovereign status requires.

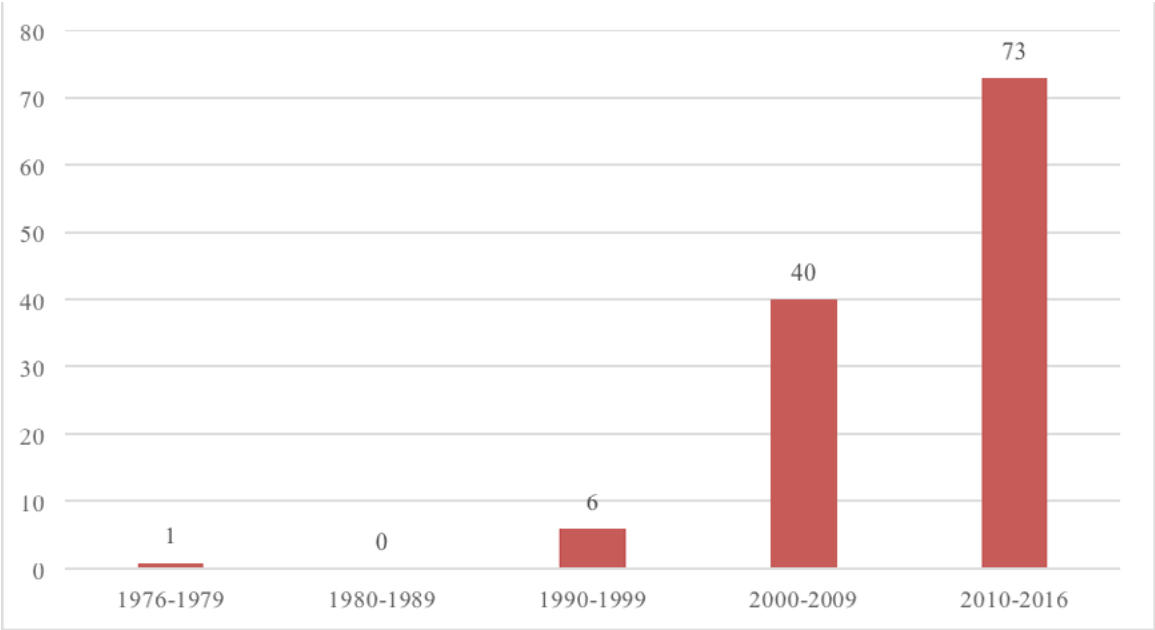

Figure 1: Number of Tribal Disaster Declarations by Decade (1976-2016)

Disaster Incident Type	Number of Incidents
Severe Storms	59
Floods	31
Fires	15
Snow	4
Hurricane	4
Mud/Landslides	2
Drought	1
Tornado	1
Freezing	1
Power Outage	1
Ice Storm	1

Table 1: Disaster Incident Types (1976-2015)

Region	States in the Region	Number of Tribes in the Region
Region I	Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont	9
Region II	New Jersey, New York	6
Region III	District of Columbia, Delaware, Maryland, Pennsylvania, Virginia, West Virginia	0
Region IV	Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee	7
Region V	Illinois, Indiana, Michigan, Minnesota, Ohio, Wisconsin	29
Region VI	Arkansas, Louisiana, New Mexico, Oklahoma, Texas	66
Region VII	Iowa, Kansas, Missouri, Nebraska	9
Region VIII	Colorado, Montana, North Dakota, South Dakota, Utah, Wyoming	28
Region IX	Arizona, California, Hawaii, Nevada	142
Region X	Alaska, Idaho, Oregon, Washington	270

Table 3: Ten FEMA Tribal Regions by State and Number of Tribes

FEMA Region	Total Number of Tribes in the Region	Tribes with No FEMA Engagement and No Disaster Plan in Effect	Tribes Engaged with FEMA with No Disaster Plan in Effect	Tribes Engaged with FEMA with Approved Disaster Plan in Effect
Region I	9	3 (33.3%)	0 (0.00%)	6 (66.7%)
Region II	6	5 (83.3%)	0 (0.00%)	1 (16.7%)
Region III	0	N/A	N/A	N/A
Region IV	7	2 (28.6%)	1 (14.3%)	4 (57.1%)
Region V	29	17 (58.6%)	5 (17.24%)	7 (24.1%)
Region VI	66	26 (39.4%)	11 (16.7%)	29 (43.9%)
Region VII	9	4 (44.4%)	1 (11.1%)	4 (44.4%)
Region VIII	28	14 (50.0%)	2 (7.14%)	12 (42.9%)
Region IX	142	84 (59.2%)	28 (19.7%)	30 (21.1%)
Region X	270	219 (81.1%)	27 (10%)	24 (8.9%)
Total	**566**	**374 (66%)**	**75 (13.25%)**	**117 (20.67%)**

Table 4: 2015 Regional Comparison of Tribes Regarding Disaster Planning Status

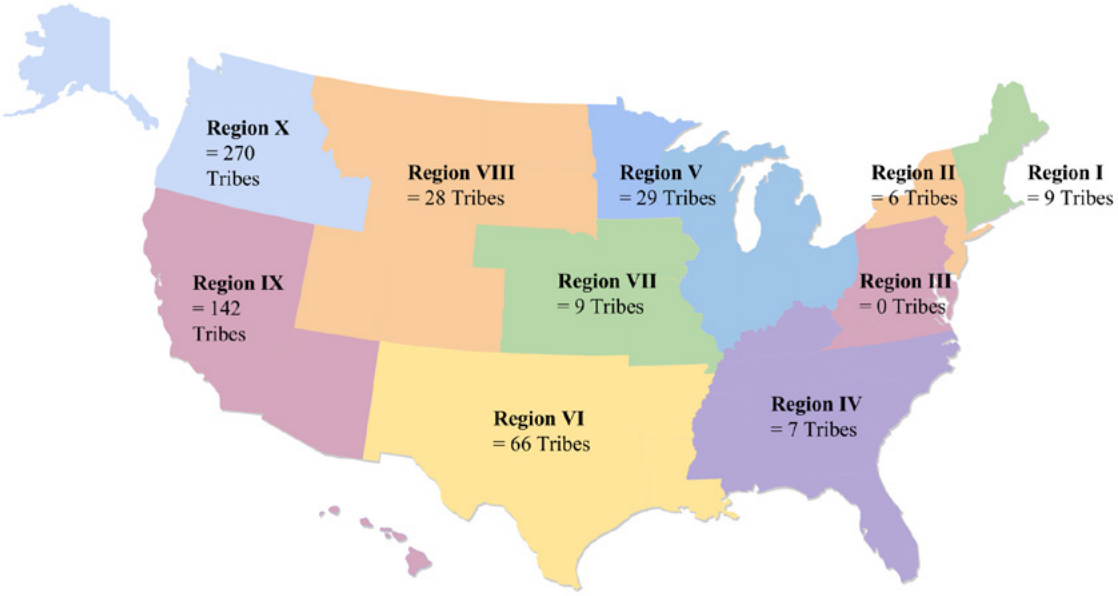

Figure 2: Map of Ten FEMA Tribal Regions with Number of Tribes per Region

tion on February 14, 2013, and after this request was granted on March 1, FEMA arrived within two days. The whole process was labeled a success by the tribe and by FEMA.

"We did not necessarily anticipate being the first tribe to receive the declaration. But I think through the recent disaster that we had with all of the flooding, we're glad that we could set a stage for other tribes throughout the nation," Eastern Band of Cherokee Indians Principal Chief Michell Hicks told *Indian Country Today*. "The unfortunate part of this is that we have the damage. The fortunate part of this is that we are helping to set a good precedent for tribes to seek assistance working directly with the President through FEMA" (Indian Country Today Media Staff, 2013).

The Karuk tribe of California is another tribe that received a Presidential Disaster Declaration after the passage of the Sandy Recovery Improvement Act. The Karuk were affected by a wildfire that raged between July 29 and August 2, 2013. The fire damaged 32 houses and destroyed 85 acres of tribal land. Tribal Self-Governance Coordinator Jaclyn Goodwin reported that the FEMA Region X Office in San Francisco assisted the tribe with the disaster declaration. "They guided us through all the necessary paperwork and all the back-up documentation that we needed to provide them," she told Indian Country Today (Daffron, 2013).

Because they had FEMA-approved disaster mitigation plans in place, the Eastern Band of Cherokee Indians and the Karuk were able to successfully use the new streamlined disaster declaration process. Yet, since only 20 percent of federally recognized tribes have such plans, the vast majority are ineligible to participate the FEMA mitigation process.

Tribes and disaster mitigation plans

The FEMA dataset that we used for our analysis included information for 566 federally recognized tribes. Those tribes were not distributed evenly across the United States or across the ten FEMA regions. Indeed, the number of tribes varies dramatically by region (see Figure 2 and Table 2), with the highest number of tribes located in FEMA Region X (where there are 270 tribes, with 228 tribes in Alaska alone), and the fewest in Region III (where there are no federally recognized tribes).

Not only do the number of tribes vary across the FEMA regions, but so does the number of tribes engaged in disaster mitigation planning. As shown in Table 4, Region I, which includes Connecticut, Maine, Massachusetts, and Rhode Island, has the highest proportion of approved plans per tribe, with six of the nine tribes (66.7 percent) having mitigation plans. Conversely, in Region X—which spans Alaska, Idaho, Oregon and Washington—only 24 of the 270 tribes (8.9 percent) have disaster mitigation plans in effect. In Alaska, the state with the largest number of tribes, FEMA reports that just 3 of the 228 tribes (1.31 percent) have currently approved disaster plans.

Disaster Planning Status

The low rates of participation across the FEMA tribal regions is worthy of concern. But the uniquely low rates in Region X, and in Alaska in particular, are especially alarming. Native Alaskans have been bearing the brunt of climate-induced disasters, and their struggles have been well documented in academic literature and news articles. More than a decade ago, the Government Accountability Office (GAO) found that flooding and erosion affected 184 of 213 Alaskan Native villages (86 percent) due to sea level rise. In a 2009 report, the GAO concluded that 31 villages were in "imminent danger" from climate-induced disasters (GAO, 2009).

The Alaskan village of Newtok—home to the Yupik people—has recently been in the news. Newtok has fallen victim to rising sea levels and its inhabitants have seen as much as 100 feet of land disappear into the ocean each year. The village also has high rates of poverty, social isolation, and poor health outcomes. The tribe, although motivated to plan for climate-induced disasters, has struggled to raise the estimated $130 million in funds needed to

move their village to higher ground (Semuels, 2015).

Challenges for tribal disaster preparedness

With the rising number of disasters across the nation and the alarming toll of these events in vulnerable tribal areas, the need to tackle this escalating issue is more salient than ever. Yet, cost barriers to tribal mitigation planning and action are real. With cutbacks for disaster mitigation activities at the local, state, and federal level, there is decreased capacity to assist tribes with disaster management. In addition, as Rod Mendez, director of emergency services for the Hoopa Valley tribe of California, said in April 2013 that "most tribes don't have plans because they haven't had money for plans" (FEMA, 2013: 15).

While some federal funding is available for disaster mitigation planning, producing a disaster mitigation plan can still be a daunting process for smaller tribes. A typical disaster mitigation plan for a tribe may range between 100-500 pages depending on the size of tribe. This paperwork requires many technical assessments that must be conducted by engineers and surveyors. For smaller tribes that do not have dedicated emergency management teams, the production of a mitigation plan or of a grant application could be nearly impossible without outside assistance. Indeed, FEMA Administrator Craig Fugate told U.S. Senate Committee on Indian Affairs in 2011 that "many tribes don't have the ability, because of the complexity of the programs and the size of the tribe, to serve as a grantee because of the financial oversight requirements" (U.S. Senate, 2011: 14).

Physical isolation represents another challenge in the planning process. In Alaska, for example, 42 percent of the AIAN population are living in areas not accessible by a road (Goldsmith, 2008). Other tribes are located in similarly remote regions of the United States, especially in the West.

This physical isolation is amplified by culturally-based communication challenges and mistrust of government authorities. Some American Indian and Alaska Native governments have reported experiencing difficulty balancing traditional beliefs with modern, westernized approaches to mitigation planning. As Redsteer et al. (2013) argue, federal frameworks often do not appreciate traditional knowledge viewpoints that account for culturally sacred sites and culturally specific resource management practices: "If sacred sites are not recognized, there is a substantial chance of increased conflict, which would constrain or even derail efforts to maintain resilient cultural and natural resources" (Redsteer et al., 2013: 396).

The very concept of planning for disaster represents a cultural barrier for some tribes, as tribal members may hold deep-rooted beliefs that the very act of planning potentially causes disaster. The following excerpt from the Navajo Nation Multi-Hazard Mitigation Plan illustrates this challenge: "The Navajo Nation and the Navajo People (Diné) find the subject of hazard mitigation hard to speak of and hard to prepare for. The idea of preparing for disaster from a traditional point of view is asking for disaster. One plans for the future wellbeing of one's family, the planting of crops, or the shearing of sheep. One does not plan for the proverbial rainy day, because it may offend the rain."

Even if these challenges are overcome and a plan is submitted for FEMA approval, there is no guarantee that a plan will be accepted on the first review. Multiple revisions may be and often are required before a final copy is approved. FEMA also requires that a tribe's disaster mitigation plans be updated every five years. As of September 30, 2015, 42 tribes have expired disaster plans, rendering them ineligible for disaster mitigation funding in the event of a sudden disaster. A tribe may submit a plan after an event but this is a difficult task when overwhelmed by the disaster.

Future suggestions

Recent legislative changes have led to more direct access among American Indian and Alaska Native tribes to the federal government. Yet, planning costs, the inability to access technical experts, physical isolation, and cultural differences remain as serious challenges to tribal participation in disaster mitigation planning.

The rising number of disasters affecting tribal areas and the fact that 449 of 566 federally recognized tribes do not have a FEMA-approved disaster mitigation plan underscores the urgency of making planning participation for tribes a priority for both federal and tribal governments. In order to make this a reality, we suggest several immediate actions.

First, the low participation rates are disturbing and there is thus much to be learned about why so many tribes are not engaging in the FEMA mitigation planning process and why it varies so much by region. FEMA has a dedicated Tribal Affairs Branch and Regional Tribal Liaisons for each of the ten FEMA regions. How this branch and the liaisons work with the tribes, and how receptive the tribes are to these outreach efforts, has not been systematically documented. Further investigation into these relationships and other potential barriers to participation is clearly warranted.

Second, the disaster data that we analyzed (see Carter, 2016, for complete results) indicate that some tribes have experienced repetitive losses, yet still have not engaged with FEMA to mitigate future disasters. These tribal disaster hotspots should be prioritized for immediate outreach from FEMA Regional Tribal Liaisons and other emergency preparedness experts to encourage mitigation planning. Technical and financial support should be provided to facilitate this as soon as possible.

Third, disaster mitigation planning is only likely to be successful if other forms of social, economic, and environmental vulnerability are addressed. As such, we believe that disaster mitigation planning can and should be tied to other efforts to move toward more socially just and equitable tribal policies.

Fourth, the minority of tribes that have actively engaged with FEMA and have approved disaster mitigation plans

available may serve as exemplars and even guides for other tribes. These tribes should be invited to share the lessons they have learned during the process and the technical and financial resources they drew upon to successfully plan and mitigate. There are many lessons to be learned from these mitigation leaders, and future research should document their trials and triumphs with the planning process.

REFERENCES

Adams, Heidi. 2012. "Sovereignty, Safety, and Security: Tribal Governments under the Stafford and Homeland Security Acts." *American Indian Law Journal* 1(2): 127-146.

Carter, Lucy. 2016. "An Investigation of United States Federal Policy Attempts to Reduce American Indian and Alaska Native Disaster Vulnerability" Masters Thesis, Department of Sociology, Colorado State University.

Cutter, Susan L., Bryan J. Boruff, and W. Lynn Shirley. 2003. "Social Vulnerability to Environmental Hazards." *Social Science* 84(2): 242-261.

Dash, Nicole. 2013. "Race and Ethnicity." Pp. 113-137 in *Social Vulnerability to Disasters*, 2nd ed., edited by Thomas, D. S. K., B. D. Phillips, W. E. Lovekamp, and A. Fothergill.

Daffron, Brian. 2013. "6 Tribes that Took Advantage of Amendment for FEMA Relief in 2013." *Indian Country Today Media Network*, December 6, 2013. http://indiancountrytodaymedianetwork.com/2013/12/06/6-tribes-took-advantage-amendment-fema-relief-2013-152597 (accessed on March 30, 2016.)

Federal Emergency Management Agency. 2010. "Tribal Policy." Washington, DC: Department of Homeland Security. https://www.fema.gov/media-library/assets/documents/25324 (accessed on September 29, 2015)

Federal Emergency Management Agency. 2013. "National Tribal Consultation Closing Conference Call-April 18, 2013, 3:00 pm Eastern." Washington, DC: Department of Homeland Security

Federal Emergency Management Agency. 2015. What is Disaster Mitigation? Washington, DC: Department of Homeland Security. Updated November 11, 2015. https://www.fema.gov/what-mitigation (Accessed March 17, 2016.)

Fothergill, Alice, Enrique G. M Maestas, and JoAnne D. Darlington. 1999. "Race, Ethnicity, and Disaster in the United States: A Review of the Literature." *Disasters* 23(2): 156-73.

Gautam, Mahesh. R., Karletta Chief, and William J. Smith, Jr. 2014. "Climate Change in Arid Lands and Native American Socioeconomic Vulnerability: The Case of the Pyramid Lake Paiute Tribe." Pp. 77-91 in *Climate Change and Indigenous Peoples in the United States*, edited by J. K. Maldonado, C. Benedict, and R. Pandya. Gewerbestrasse: Springer International Publishing GB.

Goldsmith, Scott. 2008. "Understanding Alaska's Remote Rural Economy." Institute of Social and Economic Research. Anchorage: University of Alaska.

Government Accountability Office. 2003. "GAO-04-142, Alaska Native Villages: Most Are Affected by Flooding and Erosion, but Few Qualify for Federal Assistance." Washington, DC: Government Accountability Office. http://www.gao.gov/new.items/d09551.pdf (accessed on October 31, 2015)

Government Accountability Office. 2009. "GAO-09-511, Alaska Native Villages: Limited Progress Has Been Made on Relocating Villages Threatened By Flooding and Erosion." Washington, DC: Government Accountability Office. http://www.gao.gov/new.items/d04142.pdf (accessed on October 2, 2015.)

Horowitz, Sari. 2014. "The Hard Lives – and High Suicide Rate – of Native American Children on Reservations." *The Washington Post*. March 9, 2014. https://www.washingtonpost.com/world/national-security/the-hard-lives--and-high-suicide-rate--of-native-american-children/2014/03/09/6e0ad9b2-9f03-11e3-b8d8-94577ff66b28_story.html. (accessed on March 25, 2016)

Indian Country Media Today Network Staff. 2013. "Eastern Band of Cherokee Indians First to Receive Disaster Aid Under Amended Law." *Indian Country Media Today Network*, March 2, 2013. http://indiancountrytodaymedianetwork.com/2013/03/02/eastern-band-cherokee-indians-first-receive-disaster-aid-under-amended-law-147964 (accessed on March 30, 2016).

Leemon, Elizabeth, S. 2014. "A Voice in the Storm: Tribal Consultation in the Wake of the Sandy Recovery Improvement Act of 2013." *American Indian Law Journal* 2(2): 589-606.

Redsteer, Margaret .H., Kirk Bemis, Karletta Chief, Mahesh Guatuam, Beth Rose Middleton, Rebecca Tsosie et al. 2013. "Unique Challenges Facing Southwestern Tribes." Assessment of Climate Change in the Southwest United States: A Report Prepared for National Climate Assessment. Washington, DC: Island Press.

Semuels, Alana. 2015. "The Village that Will be Swept Away" *The Atlantic.* August 30, 2015. http://www.theatlantic.com/business/archive/2015/08/alaska-village-climate-change/402604/ (accessed on March 20, 2016.)

U.S. Interagency Council on Homelessness. 2012. "Report on Homelessness among American Indians, Alaska Natives, and Native Hawaiians." https://www.usich.gov/tools-for-action/report-on-homelessness-among-american-indians-alaska-natives (accessed on April 21, 2016).

U.S. Senate Committee on Indian Affairs. 2011. "Floods and Fires: Emergency Preparedness for Natural Disasters in Native Communities." Washington, DC: U.S. Senate.

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Aim for Two Plan for Four

Why We Need to Broaden Our Adaptation Goals

By Matt McRae

IN DECEMBER international leaders met in Paris at the United Nations Climate Change Conference (UNFCCC) during the twenty-first "Conference of Parties" (COP21) with the goal to "achieve a legally binding and universal agreement on climate, with the aim of keeping global warming below 2°C above preindustrial temperatures"(COP21, 2016). Delegates discussed and agreed on national targets, but simple math reveals a harsh truth— if we manage to hit the targets agreed upon in Paris we will still experience a dangerous 2.7°C - 3°C warming above pre-industrial levels by 2100. While these numbers appear small, climate-adaptation practitioners understand the implications are anything but. Somewhat ironically, at the same UN Conference of Parties, there was also collective agreement that the upper limit of warming should be revised downward to 1.5°C because, "The 1.5 degree Celsius limit is a significantly safer defense line against the worst impacts of a changing climate" (UNFCCC, 2016).

This ratcheting down of the temperature target speaks volumes about the predicament we're in. Changes are occurring faster than we anticipated and we continue approaching blind curves at high speed.

I began working on climate change eight years ago. As my understanding of the issue deepens and I watch national and international efforts come up short year after year, I have to wonder if our climate adaptation sights are aimed at the wrong target.

I have had the fortune of working on climate mitigation and adaptation while serving as the Climate and Energy Analyst for the City of Eugene, Oregon. During this time I have come to a few realizations that have fueled my growing concern. First, the greenhouse gas-emissions reductions that are scientifically necessary appear to be all but unachievable. Second, scientists anticipate that as we move beyond 2°C of warming, there is a dramatic increase in the risk of rapid warming magnified by naturally occurring feedbacks within the climate system—sometimes referred to as "runaway" climate change. Finally, and perhaps most troubling, our current climate adaptation efforts are focused on a future stable climate condition that appears highly unlikely.

First, the emissions challenge. I recently have been tasked with developing a greenhouse gas-reduction target for Eugene that is consistent with returning global concentrations of CO_2 to 350 parts per million (ppm), the CO_2 level climate scientists tell us is least likely to trigger runaway global heating. It should be noted that global CO_2 concentrations surpassed 400 ppm nearly a year ago for the first time in recorded history, so a 350ppm target is extremely ambitious. We found that doing our share to meet 350ppm means we must stop emitting CO_2 within 15 years (Hansen et al 2015). For comparison, we looked at what would be needed to achieve 450ppm (the number expected to limit warming to 2°C). While more feasible perhaps, getting to 450ppm would still require emissions to drop from today's levels to almost zero within 35 years. While this may be technically possible, our climate-mitigation goals and actions in Eugene, and across most of the country, are not geared to achieve this scale of reductions. I hold on to hope that we will find the will to achieve these levels of reductions, but I do not believe it is responsible to assume these dramatic emissions reductions as a basis for climate adaptation planning. As climate-adaptation practitioners, we are trying to reduce risks posed by climate impacts, so we should be planning for likely outcomes, not banking on the best possible scenario.

The second lesson I have learned is that there are feedbacks in our climate system that have a huge potential to increase global temperatures. A great example is the Arctic ice sheet at the top of the planet. Like a giant mirror, the white surface of the sea ice reflects most of the incoming sunlight back into space. As warming causes the ice to recede, it is replaced by dark ocean waters, which absorb the light energy, turning it into heat energy, increasing warming and further melting the ice in a self-reinforcing loop. The trouble is that several such natural feedbacks exist within the climate system and when combined they have great potential to cause extreme warming. Unfortunately, because we don't know exactly when these feedbacks will kick in, they are not always accounted for in climate models, meaning that we are likely to significantly underestimate the potential speed of warming. These feedbacks are one of the reasons we have set an international goal to stay below 2°C of warming—because somewhere at or beyond that temperature, the feedbacks are unleashed and, like it or not, we find ourselves on an uncontrollable escalator to dramatically warmer temperatures. We are currently experiencing 1°C of warming, and total global greenhouse gas emissions continue to increase every year

My third realization is that the majority of our climate-adaptation plans focus on a 2°C warming scenario that stabilizes at 2°C and doesn't warm further. In reality, climate is rarely stable. Over the last 800,000 years the average temperature of the globe has jumped up and down like a heartbeat. This fluctuation has been cyclic and driven

by natural processes, but if we look into Earth's climate history there is an odd stabilization of temperatures that began some 10,000 years ago. As a species we have benefitted immensely from this unusual period of relative climatic stability; it has encouraged long-term settlement along our coastlines and it has enabled development of wildly successful agricultural practices. How will we adapt as we enter a period of climatic conditions that are far less predictable and far more dynamic than our recent history has prepared us for? While I hope we can find a way to limit warming to 2°C and avoid unleashing feedbacks, good risk management suggests we should anticipate and prepare for less rosy outcomes. I believe we should re-calibrate our adaptation efforts to anticipate 4°C and continued warming. I will be first to acknowledge that 4°C of warming and an unstable climate is increasingly difficult to "adapt" to, but planning for a more moderate level of impacts just because it feels less overwhelming is not the basis of good risk management.

In 2011 an international team of scientists provided a clue about the potential impact of four degrees of warming (New et. al, 2011). They note, "Even with strong political will, the chances of shifting the global energy system fast enough to avoid 2°C are slim. Trajectories that result in eventual temperature rises of 3°C or 4°C are much more likely, and the implications of these larger temperature changes require serious consideration." As for the impacts, the authors raise the concern, "The continued failure of the parties to the UNFCCC to agree on emissions reductions means that those planning adaptation responses have to consider a wider range of possible futures, with a poorly defined upper bound. Second, responses that might be most appropriate for a 2°C world may be maladaptive in a +4°C world; this is, particularly, an issue for decisions with a long lifetime, which have to be made before there is greater clarity on the amount of climate change that will be experienced. For some of the more vulnerable regions, a +4°C world may require a complete transformation in many aspects of society, rather than adaptation of existing activities."

As adaptation professionals we haven't had a discussion about adapting to higher temperatures. The good thing is that many of the efforts I imagine we might employ to "adapt" to 4°C are also desperately needed today and would help us manage 2°C of warming as well. What do those strategies look like? How would we implement them? I propose that in addition to (or perhaps instead of) focusing on structural adaptation like building sea walls, we might also focus on supporting social adaptation that would both help our communities to navigate uncertainty and disruptions in the future and help us address the challenges of today.

This could involve boosting psychological resilience through workshops that improve mental coping skills. The Resource Innovation Group, for example, has hosted workshops in several cities including Eugene. They are teaching people useful skills in mindfulness, meditation and trauma management to help people cope with the stresses they're experiencing today – and to spread habits that could help us all handle the curveballs of tomorrow.

Adapting to four degrees might involve promoting community cohesion by better bridging the racial, cultural, and economic divides in our communities. In his book Heatwave, Eric Klinenberg writes of a deadly spell of extreme heat in Chicago in 1995. With scientific rigor he investigates the horrible event, comparing neighborhoods full of survivors with neighborhoods that didn't fare as well. He found the secret to survival wasn't wealth, mobility, or access to health care, it was the presence of healthy social bonds. Those residents who lived in socially connected neighborhoods fared significantly better than those living in socially isolated environments. For this reason, it seems improving social cohesion within our communities should be one of our adaptation goals.

If more frequent curveballs are in our future, perhaps we should also take measures now to enhance the transparency and particularly the nimbleness of our government decision-making. I have seen with my own eyes that making decisions on behalf of the whole is way easier said than done, but organizations like the Co-Intelligence Institute and Healthy Democracy work tirelessly to test and share examples of better collective decision-making practices. It seems self-evident that our communities will manage tough decisions better when residents are involved and genuinely understand the difficult dilemmas placed at our collective doorstep.

I certainly don't have all the answers, but I hope we might focus our attention on a broader range of climate possibilities that are more challenging than 2°C, and unfortunately, increasingly likely.

REFERENCES:

COP21. 2016. http://www.cop21paris.org/about/cop21 (accessed on April 12, 2016)

UNFCCC. 2016. "Historic Paris Agreement on Climate Change" (accessed on April 12, 2016) http://newsroom.unfccc.int/unfccc-newsroom/finale-cop21/

Hansen J, Kharecha P, Sato M, Masson-Delmotte V, Ackerman F, Beerling DJ, et al. 2013. Assessing "Dangerous Climate Change": Required Reduction of Carbon Emissions to Protect Young People, Future Generations and Nature. PLoS ONE 8(12): e81648. doi:10.1371/journal.pone.0081648

New et al. 2011. Four degrees and beyond: the potential for a global temperature increase of four degrees and its implications. *Philosophical Transactions of The Royal Society*, A 2011.

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The Rising Voices • *Building Bridges Between Scientific and Indigenous Communities*

By Heather Lazrus, Bob Gough, Julie Maldonado

Rising Voices 3 workshop in 2015 © Heather Lazrus

IN THE PAST DECADE indigenous people have been participating increasingly in conversations about climate change in national and international arenas. This trend is reflected in the U.S. National Climate Assessment, which now features a distinct section dedicated to native people. It is called Indigenous Peoples, Land and Resources (Bennett et al. 2014). Internationally, the climate science community has recognized the need to include traditional knowledge in climate adaptation (IPCC 2014). Further, unprecedented numbers of indigenous peoples from around the world participated at the 21st Conference of the Parties (COP21) of the United Nations Framework Convention on Climate Change (UNFCCC) meeting in Paris in early December 2015. In Paris, they came with messages about the uneven impacts from a changing climate that fall disproportionately on their communities; communities which continue to be systematically marginalized by larger economic and political forces. Leading up to the meeting, the International Indigenous People's Forum on Climate Change characterized COP21 as a potential "turning point or another missed opportunity on the hard path towards climate justice" (IIPFCC, 2015). Indigenous peoples are recognized in the preamble of the Paris Agreement, but not in the legally binding operative section. As a result, there is a ways left to travel along that hard path.

Toward this end, a program called Rising Voices: Collaborative Science with Indigenous Knowledge for Climate Solutions (Rising Voices) was launched in 2013 and is housed at the National Center for Atmospheric Research in Boulder Colorado. It is devoted to amplifying indigenous voices in climate science and adaptation, and to fostering direct collaboration among scientists and indigenous communities. Rising Voices hosts annual workshops that bring together physical and social scientists, and engineers, with Native American, Alaska Native, and Native Hawaiian community members to assess community needs and to pursue joint research. Among the indigenous participants are scientists and resource managers, some of whom work for tribal agencies, but beyond Rising Voices, indigenous scientists are a small minority. The program is premised on the belief that indigenous people make valuable contributions to mitigating the causes of climate change and adapting to its impacts. To encourage this understanding and collaboration, Rising Voices has created a list of recommendations for tribal, state, national, and international policy makers that was distributed among participants of COP21 in 2015. The recommendations reflect discussions at Rising Voices workshops, drawing on the experiences, achievements, lessons, and challenges that workshop participants have shared over the last three years.

Western science and traditional knowledge

Indigenous people's traditional knowledge and adaptive strategies have developed over millennia. They constitute an integral part of the cultural identity and social integrity of many indigenous cultures. An important form of traditional knowledge is called "ecological knowledge," which is defined as "a cumulative body of knowledge, practice and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living things (including humans) with one another and with their environment" (Berkes 1999:8). The importance of such traditional knowledge is increasingly recognized by non-indigenous scientists, but few of them actually interact with indigenous communities, part-

ly because attaining the trust of community members and learning to follow culturally appropriate processes can entail significant temporal, financial, and cognitive investments (Agrawal 1995, Whyte 2013).

This challenge is what inspired the inception of Rising Voices. The program, founded by Heather Lazrus (National Center for Atmospheric Research) and Bob Gough (Intertribal Council on Utility Policy), and co-organized with Julie Maldonado (Livelihoods Knowledge Exchange Network) recognizes tremendous potential for collaborations that engage both indigenous knowledge and Western science. For instance, indigenous communities' observations of environmental change can extend the scientific record or offer contextual understandings that go beyond laboratory-based findings. In turn, scientists can explain the physical processes behind these observations and understandings. Cultural diversity is especially critical in addressing climate change problems, because without diversity of thought "we pay an opportunity cost, a cost in designs not thought of, in solutions not produced" (NRC 2002:9). We cannot afford the cost of not including diversity as we face unprecedented challenges from a warming planet.

Collaboration between indigenous communities and scientists can yield surprising results. For example, when atmospheric scientists from the University of Colorado, led by Shari Gearhard and Betsy Weatherhead learned that Inuit hunters and elders from Baker Lake in Nunavut, Canada, have been observing increasingly unpredictable and variable springtime weather since the 1990s, they initially could not makes sense of it, based on their analysis of environmental measurements, which showed no change. By listening closely to how community members described the changes in the weather the team from CU began examining hourly data of the observations and discovered that the persistence of spring temperatures have indeed dropped significantly, indicating an important shift in the Arctic environment (Weatherhead, Gearheard, Barry 2010). This is a compelling example of how bringing different sources of knowledge together and linking specific observations can offer a more comprehensive understanding of a changing Earth, just as fitting together pieces of a puzzle reveals the complete picture.

In another example, Ben Orlove, an anthropologist now at Colombia University, conducted research in the Peruvian Andes with two atmospheric scientists, one from the University of California, Berkeley and one also from Colombia University, to investigate a phenomenon they had both independently observed—that Andean potato farmers could forecast the rainy season several months ahead. Annually, on a night in late June, during the festival of San Juan, farmers gather to assess the visibility of the Pleiades, a star cluster in the constellation Taurus. Based on their assessment during this ritual, they predict the timing and amount of precipitation they will receive during the planting months between October and March. How could these seasonal forecasts be so accurate? Meteorological and climatological analysis showed that the Pleiades appear more clearly to the naked eye when the atmosphere is drier, signaling a dry upcoming planting season. The reverse is also true. When the Pleiades appear indistinct or partially obscured, it is because of the atmospheric moisture that would bring a wet planting season several months in the future (Orlove, Chiang, and Cane 2002).

Rising Voices 3 workshop in 2015 © Heather Lazrus

Workshops – encouraging cross fertilization

Studies that marry multiple knowledge systems have been conducted for many years—albeit in small numbers—long before Rising Voices was born three years ago. The organization recognizes the benefits of such studies and it promotes new ones that advance this collaborative and culturally sensitive approach. To promote this kind of research, Rising Voices hosts annual workshops, which have spawned programs and joint research proposals with collaborators from Indigenous and scientific communities. For example, several participants in the Rising Voices program who have attended workshops from Hawai'i are involved in the Global Breadfruit Heritage Council—a consortium of people who are building capacity for traditional Hawaiian agroforestry practices to honor and protect the genetic, cultural, spiritual, and environmental role of breadfruit trees. The Council has grown out of the lifelong work of several people who are now working to promote breadfruit as a culturally-significant, sustainable crop and gluten-free food that can be used in place of wheat. The program oversees specific projects led by Indigenous Hawaiian community members working closely with atmospheric scientists to model and monitor climate variability and change that may impact breadfruit crops. This knowledge can help cultivators plan where and when to develop agroforestry systems to support breadfruit trees which grow well in tropical areas. This work with breadfruit is leading to a national-scale phenology study to observe ecology across the country around agroforestry systems such as indigenous breadfruit agroforestry.

As for all indigenous communities represented at Rising Voices workshops, water has always been a central feature of Native Hawaiian culture, society, and governance. Today, many communities in Hawai'i mobilize around restoring cultural or natural resources using tra-

Andean potato farmers © IIED

ditional values or management and governance systems. Traditionally, Native communities were arranged in land divisions called ahupua'a, vertical swaths running from mountain tops to the seaside alongside rivers or streams in an early form of watershed management. A research project proposed by Rising Voices collaborators plans to understand how drought affects vestiges of the ahupua'a system as well as other cultural practices for which water is central, including farming kalo, another traditional staple along with breadfruit. The proposed research reflects other examples of successful watershed-based, inter-tribal management of numerous water-related sectors such as the Yukon River Intertribal Watershed Council which manages local land use, solid waste, energy, and drinking water.

Challenges

Some speed bumps on the path to implementing this kind of collaborative research may seem mundane, but can make or break research. Besides the more nuanced challenges to successful collaborations, such as building mutual trust, which takes a lot of time, energy, and funding, following appropriate cultural protocols can also be challenging. Scientists must understand that indigenous knowledge is not an "extractable resource" and may be sensitive, sacred, or secret. Appropriate protocols include meeting with community leaders or Institutional Review Boards.[1]The process for this sort of collaborative research may look very different from research conducted in laboratories. For instance, from the very beginning scientists need to inform community collaborators how the research questions are asked, what scale of analysis is appropriate, and how the information is accessed and assessed. All of these factors are discussed at Rising Voices workshops. Some participants have written a helpful guide book, called Guidelines for Considering Traditional Knowledges in Climate Change Initiatives. It was prepared for the Department of Interior Climate Change Advisory Committee (Climate and Traditional Knowledges Workgroup 2014).

1 An Institutional Review Board (IRB) is a committee established to review and approve research involving human subjects. The purpose of the IRB is to ensure that all human subject research be conducted in accordance with all federal, institutional, and ethical guidelines.

Increasingly, it is the small but growing pool of indigenous scientists who have helped bridge the gap between indigenous communities and non-indigenous researchers. Indigenous scientists can play important roles by bringing their culturally-informed perspectives to their science, and they can explain to communities why scientific insight is meaningful and relevant to them.

Unfortunately, indigenous people are still underrepresented in atmospheric sciences, decision-making, and policy efforts. Suzanne Van Cooten, a hydrometeorologist, examined the participation of Native American/Alaska Natives in weather and water academic programs and the federal workforce. Her data shows that, across the United States, between 2000 and 2008, 5350 PhDs were awarded to students in Earth, oceanic, and atmospheric sciences. Only 17 of these were awarded to Native American and Alaska Native students. According to Van Cooten, another reason for the dearth of indigenous people in leading positions in scientific and engineering organizations is that few of them exist at junior levels.

Recommendations

Aiming to achieve a more positive trendline for indigenous communities and scientists alike, experts, students and science professionals—both indigenous and non-indigenous—who have participated in to Rising Voices workshops over the last three years submitted a list of recommendations for policy makers across all scales of decision making, which was sent to a number of COP21 participants.

One of our key recommendations calls for the inclusion of indigenous perspectives, insights, and knowledges in agency-led and nationally and internationally appointed assemblies concerned with natural resources, environmental management, and policy. The free, prior, and informed consent of indigenous people should be respected when these assemblies are formed and engagement with indigenous peoples is included, as per the United Nations Declaration on the Rights of indigenous Peoples. Indigenous peoples have a rich knowledge of their environment that is important for filling in lack of data and for developing adaptation and sustainable strategies.

Another recommendation focuses on building the ca-

A resident of Halawa Valley, Molokai, Hawaii, pounds breadfruit into poi, a traditional Polynesian staple food made of taro. © PROKristina D.C. Hoeppner

Breadfruit © Harvey Barrison

pacity of youth leaders to be fluent in both scientific and indigenous knowledge in order to inform practice and policy. Rising Voices participants suggest the creation of a Climate Change Service Corps to support youth from indigenous and non-indigenous backgrounds to work with communities and with scientists to find climate solutions. Capacity would be enhanced through mentorships, scholarships, and internships with local federal agencies. Ultimately, the Climate Change Service Corps will strengthen resilience amongst indigenous and non-indigenous communities around the country— and potentially internationally—for the near- and long-term. This recommendation may also bring more indigenous people into the atmospheric sciences, reducing the gap discussed above.

Also based on indigenous understandings of ecology, participants recommended that a practice of ecological renovation replace current approaches of ecological restoration. Ecological renovation goes further than restoration to revitalize ecosystems and thereby also the communities which depend on them. Place-based community observations, citizen-science programs, and community-to-community exchanges of knowledge and experience form bases for ecological renovation. This recommendation is embodied by the Global Breadfruit Heritage Council's work to promote Native Hawaiian agroforestry practices which layer multiple plant species in one "food forest," thereby increasing species diversity and promoting ecological health.

A specific recommendation addresses water. Recognizing the centrality of water to our nation's ecosystems and citizens' livelihoods, participants proposed an Indigenous Water Network which would be a collaborative, international network based on examples such as the Yukon River Intertribal Watershed Council and the native Hawaiian practice of ahupua'a watershed management described above. The Network would facilitate multi-government action across scales to manage water resources.

Towards climate justice

These recommendations will help advance the understanding and practice of "climate justice" in the United States and throughout the world. Climate justice intrinsically links the causes, consequences and cures of environmental degradation—especially flowing from climate change— with the racial, social, and economic inequities that the degradation perpetuates. For indigenous communities who are already rendered vulnerable due to histories of colonization, the impacts of climate change further weaken adaptive capacities stored in traditional knowledge and practices. Justice and science are inseparable. Indigenous peoples' voices must be heard, and one way to do this is to include more people from indigenous communities as collaborators with and members of scientific institutions, spanning from research organizations to policy making agencies. Institutional change is needed to foster the sorts of trust and respect that are required for cross-cultural collaborations, and to safeguard traditional knowledge so that it is always treated culturally sensitive. These recommendations, if implemented, could infuse atmospheric science and climate-change policy with more cultural diversity, novel approaches and solutions. That change would benefit everyone, all cultures—indigenous and non-indigenous, scientists and non-scientists.

REFERENCES

Bennett, T. M. B., N. G. Maynard, P. Cochran, R. Gough, K. Lynn, J. Maldonado, G. Voggesser, S. Wotkyns, and K. Cozzetto. 2014: Ch. 12: Indigenous Peoples, Lands, and Resources. Climate Change Impacts in the United States: The Third National Climate Assessment, J. M. Melillo, Terese (T.C.) Richmond, and G. W. Yohe, Eds., U.S. Global Change Research Program, 297-317. doi:10.7930/J09G5JR1.

Climate and Traditional Knowledges Workgroup (CTKW). 2014. Guidelines for Considering Traditional Knowledges in Climate Change Initiatives. https://climatetkw.wordpress.com (accessed April 1 2016).

National Research Council. 2002. Diversity in Engineering: Managing the Workforce of the Future. The National Academies Press.

IIPFCC. 2015. Our Proposals to COP21 and Beyond. November 29, 2015. http://www.iwgia.org/iwgia_files_news_files/1290_IP_Political_statement.pdf (accessed on April 26, 2016)

Orlove, B., Chiang, J., Cane, M. 2002. Ethnoclimatology in the Andes: A cross-disciplinary study uncovers a scientific basis for the scheme Andean potato farmers traditionally use to predict the coming rains. *American Scientist* 90(5):428-435.

Redsteer, M.H., Kelley, K.B., Francis, H. and Block, D. 2010. Disaster risk assessment case study: Recent drought on the Navajo nation, southwestern United States. Background Paper prepared for the 2011 Global Assessment Report on Disaster Risk Reduction. Geneva, Switzerland: UNISDR. Van Cooten, Suzanne. 2014. Where Are the Indigenous Scientific Leaders? Examining the Participation of Native American/Alaska Natives in Weather and Water Academic Programs and the Federal Workforce. *Bulletin of the American Meteorological Society*. 95(11): 1725–1740.

Weatherhead, E., S. Gearheard, and R. G. Barry. 2010. Changes in weather persistence: Insight from Inuit knowledge. *Global Environmental Change* 3: 523-528.

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Gough and COUP President Patrick Spears were the recipients of the Inaugural World Clean Energy Award, Special Award for Courage, from Facktor Four, Basel, Switzerland (2007) for the Tribal Wind, Federal Hydropower plan they developed for harnessing the renewable energy of the northern Great Plains. They also co-chaired and steered the Native Peoples/Native Homelands workshops (1998 and 2009). Gough contracted with the National Renewable Energy Laboratory's Wind Powering Native America program (2000-2009), receiving the DOE Wind Energy Program Outstanding Technology Acceptance Award (2004). He was lead author for the national climate assessment's Indigenous Peoples, Lands and Resources chapter (2014), co-founded the Rising Voices gatherings at UCAR/NCAR and is a member of Pacific Risk Management Ohana (PRiMO) IKE Hui. Since 2012, Gough has been a certified instructor with FEMA's National Disaster Preparedness Training Center working primary to promote tribal leadership and community resilience awareness.

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MARS, MANHATTAN, AND LESSONS ABOUT DISASTERS

By Tricia Wachtendorf

THE MARTIAN was shut out from an Oscar this year, but there may be some consolation in the fact that movie-goers mostly have praised the film. Hollywood has recognized for ages the emotional payoff that audiences experience by witnessing people overcome great challenges under immense pressure. Such storylines appeal to our desires for heroics and the against-all-odds endeavor to achieve the seemingly impossible. Yet the merits of *The Martian* extend beyond such superficial observations. The real success in the film's narrative is how accurately it portrays the genuine way in which people tackle enormous obstacles under crisis: in bite-sized chunks and with the help of others.

The protagonist of the film, Captain Mark Watney, played by Matt Damon, could not have lived long on the Red Planet's toxic landscape without his extensive training and knowledge, but nor could he have survived without his ability to enact creativity, flexibility, and improvisation. At the film's closing, the audience is instructed that, when faced with what appears to be an insurmountable crisis, "You just begin….You solve one problem and you solve the next problem, and then the next."

Findings from decades of research on disaster events, as well as those from our own studies, tell us that Mark Watney had it right. Even, perhaps especially, the most catastrophic events are best contended with by people drawing on their own areas of expertise. They are most receptive to the novel participation and ideas of others, and to incrementally solving smaller problems, one at a time.

Almost 15 years ago on September 11, 2001, for example, hundreds of mariners converged to Manhattan's waterfront to perform a Dunkirk-like boatlift of approximately 500,000 people. A flotilla of ferries, dinner cruise vessels, and tugs achieved this remarkable task despite having no specific plans in place. James Kendra and I were fortunate enough to speak with 100 people involved in various aspects of this response. From captains to crew members, from those who were on the water to those on the shoreline, from those dispatching boats to those dispatching buses, our interviews with these participants took place in offices, on boats, in restaurants, and on piers.

These conversations revealed that while the Coast Guard and harbor pilots certainly coordinated with this emergent effort, most of the actions on the water and shoreline were decentralized—individuals simply doing what *The Martian* espoused: just beginning and solving one problem after the other. Indeed, "We did what we had to do" was repeated many times by those we interviewed. Be it welders cutting down fences to better allow embarkation, or crew on a restored fireboat using coke bottles to divert water into hoses, people improvised repeatedly.

And they broke rules, as did the characters in *The Martian*. Our real-life characters broke rules in areas where they had expertise. But they preserved the underlying purpose of the rules, and they deliberated with other people before breaking the rules. This is quite different from the normalization of deviance, as described in Diane Vaughn's study (1996) of the Challenger space shuttle disaster, John Banja's study of healthcare (2010), and Lucien Canton's critique of ignoring the rules during a crisis. In the film, broken rules without an intense knowledge of them, con-

siderable expertise in and respect for practice and science, repeated consultation, and a shared vision of having all crew members return home safely, would have resulted in Watney's certain death, as well as the death of his crewmates. On 9/11 the mariners' deep understanding of the rules, specialized knowledge, shared value of safety, and careful consideration were instrumental in this operation's success.

We sometimes forget the value of improvisation done with expertise, vigilance, and the desire to achieve a shared vision

Unlike most films in the disaster genre, solving the dual disastrous dilemmas of surviving alone on Mars and mounting a rescue mission to save the astronaut did not come down to a lone individual saving the day. What was accomplished was achieved only because many people contributed their ideas, their talent, their labor, their equipment, and their resources. Watney was proactive, but often his attempts hinged upon someone, somewhere, literally on a distant planet, looking at the same information and coming to the same conclusion as his. Again, such occurrences are not limited to the silver screen. During the boat evacuation on September 11, mariners across the harbor saw similar information—be it on television or from the water—and made sense of it to the same conclusion: that the help of boats would be needed. This was even before the Coast Guard officially issued a call for assistance.

Officials often talk about trying to understand the big picture. In more routine emergencies, such a conception might fit, but this objective is impossible in large complex events. Still, people start working on their own part of the picture, having faith that someone elsewhere is doing the same, until the pieces of the puzzle start to fit. That's how it worked for Watney on Mars, the Hermes crew en route home, and the various NASA engineers and international collaborators. That's how it worked for the mariners and shoreline volunteers in the vicinity of Ground Zero. And that's how it works in many of the effective large-scale disaster responses.

As a nation we have moved toward an increasingly tightly controlled disaster-management environment. We sometimes forget the value of improvisation done with expertise, vigilance, and the desire to achieve a shared vision. The character Mark Watney, star man or intergalactic pirate that he was, succeeded because he was part of a larger group of people learning under conditions of extreme stress, availing themselves to new ideas, forming new relationships, suspending existing procedures, and developing new ones. The mariners on 9/11 succeeded because their community shared such similar features. On Mars, in Manhattan, or elsewhere when disaster strikes, successful responses frequently involve ordinary people achieving the extraordinary, solving one problem at a time.

REFERENCES

Banja, J. 2010. "The Normalization of Deviance in Healthcare Delivery" *Business Horizons*, 53(2), 139. (Accessed on March 1, 2016) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2821100/

Canton, L.E. 2016. "Ignoring the Rules Can Increase You Risk: Letting the Rules Slip a Little Can Have Unexpected Consequences in a Crisis" *Emergency Management January* 27. (Accessed on March 1, 2016) http://www.emergencymgmt.com/emergency-blogs/managing-crisis/fema-releases-the-national-planning-system-so-what.html

Vaughn, D. 1997. *The Challenger Launch Decision: Risky Technology, Culture, and Deviance at NASA*. University of Chicago Press: Chicago, IL

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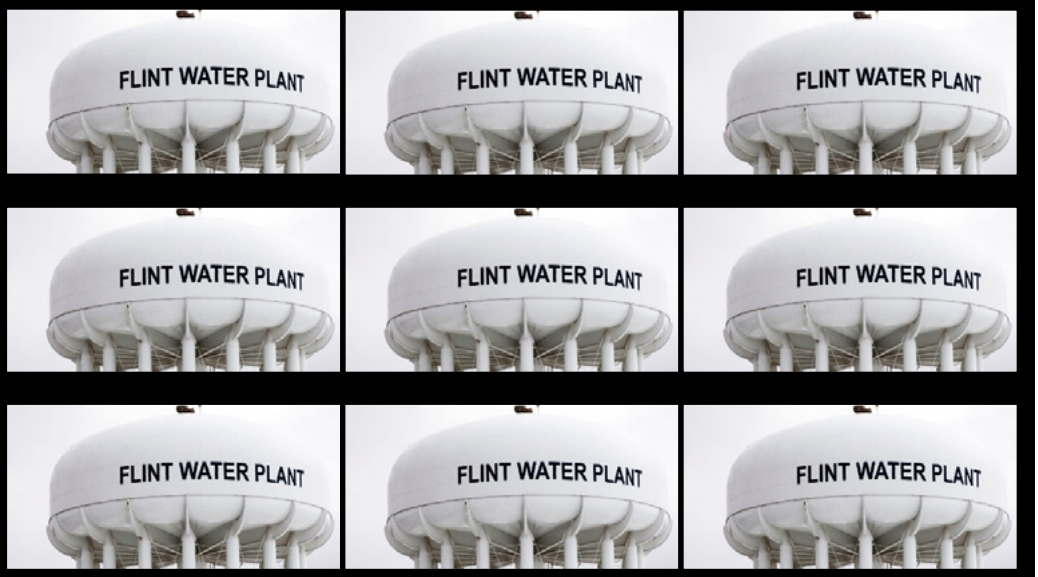
The Flint Water Crisis and Beyond

Looking Through the Lens of Environmental Justice

By Stacia Ryder



Flint Water Plant ©Ben Gordon

THE TRAVESTY IN FLINT, Mich. has served as a flashpoint for highlighting failed government responses in the wake of disastrous circumstances. Former FEMA head Michael Brown harkened back to Katrina, suggesting the government should have applied lessons learned from that hurricane to the water-contamination crisis in Flint (Young, 2016). Michigan Governor Rick Snyder has even admitted that the mishandling of the crisis in Flint constitutes "his Katrina" (Fournier, 2016). The lack of ability to apply critical response lessons from Hurricane Katrina to the Flint crisis is troubling. The shocking mix of mishandlings and cover-ups that followed is also alarming, as citizens around the country must wonder if their community is the next Flint. Beyond that, the crisis highlights the extent to which disparate vulnerabilities to risk and disproportionate impacts of hazards can become issues of environmental injustice. In its wake, other incidents of technological accidents and environmental hazards have gained visibility. As such, questions about influences on government preparedness, accountability, and response become critical for redressing current crises and preventing similar ones in the future.

With all eyes on Flint, the disaster has revealed that poor infrastructure has resulted in lead contamination in water systems across the United States—Cleveland, Ohio, Sebring Ohio, Jackson, Miss, Newark, N.J., Estes Park, Colo. and 18 Pennsylvania cities. As pointed out by presidential candidate Hillary Clinton at a recent Democratic presidential debate, lead exposure in the U.S. is also problematic in the soil, and in households containing lead paint (The Washington Post, 2016; Weesjes, 2016).

Beyond lead poisoning, other types of technological failures have dominated recent U.S. headlines, such as the Las Animas Gold King Mine spill and the natural gas leak in Porter Ranch, Calif. These instances point us toward a line of critical inquiry: What factors influence the attention and level of government response, accountability, and effectiveness in the wake of a community harmed by a technological disaster? One factor worthy of scrutiny is whether the culpable party is a private operator or a government entity. For example, the water contamination in Flint, Mich., was covered up and informing the public was drastically delayed. As a result, families in Flint suffered devastatingly. Not only are government officials at all levels to blame for the inept response, it was government entities—both the state of Michigan and the town of Flint are implicated—whose decisions and actions put contaminated water into Flint households in the first place.

The same cannot be said for the Porter Ranch leak. In this case, Southern California Gas Company delayed informing the government and the community about the spill from its pipes. However, when the state was made aware of the company's leak public officials swiftly began to address and redress the situation. The differences in government responses in Porter Ranch and Flint provoke the question: Do government reactions depend on their conceivable level of responsibility in the wake of disastrous events? That is, what role does self-preservation play in the way governments respond to disasters caused internally instead of at the hands of a private entity? Furthermore, the differences between government responses in Porter Ranch, Exide, and Flint suggest that the location of an incident and the community impacted might influence how a government responds to a hazards event.

Who suffers? Unequal risks and unequal responses to environmental hazards

Across communities government responses are not uniform. Recent articles, for example, demonstrate that the Navajo Nation has battled issues of water contamination

L) Las Animas Gold King Mine Spill © Riverhugger (R) Southern California Gas Company's Aliso Canyon facility © Scott L.

for decades (Morales, 2016), most recently dealing with last year's Gold King mine spill which contaminated the San Juan River—the Nation's primary irrigation source—with arsenic, cadmium, and lead (Duara 2015). Yet very little media coverage of the spill discusses the economic impacts it has had on roughly 550 Navajo nation farmers who had to choose whether or not to continue watering their crops, either from the river or from EPA-provided barrels that were previously used for oil storage.

Furthermore, unlike the situation in Flint, no criminal investigation has been launched regarding these damages. Just west in California's rural Central Valley, water quality has been a major concern for migrant farm workers for decades. Genoveva Isla, program director at Cultiva la Salud, points out that unlike Governor Snyder's actions to set aside money for children impacted by lead, the state of California has not set money aside for impoverished Central Valley children who face similar long-term health issues (Sager, 2016). Meanwhile, Silicon Valley's growing population and wealth have prompted major infrastructural investments in producing clean water for residents—something declining cities and impoverished communities aren't able to afford (Semuels, 2016).

A January *Los Angeles Times* editorial argues even more pointedly about divergent government responses to technological hazards (LA Times, 2016). The article compares Governor Jerry Brown's administrative response to the Aliso Canyon gas leak in Porter Ranch to lead and arsenic contamination from the now-closed Exide battery recycling plant in Vernon. The editorial board notes that in response to the situation in affluent Porter Ranch, Governor Brown "has declared a state of emergency, ordered public health reviews, and visited residents," while remaining absent in working class communities affected by the Exide disaster. Whereas thousands of Porter Ranch residents were relocated, no families impacted by the Exide disaster have been relocated. Further, only 191 of more than 10,000 potentially affected homes have been cleaned up, although warnings were first issued to residents nearly two years ago. I would argue that differences in community socioeconomic status and racial composition are in part why we see disparate reactions, and media coverage, in Porter Ranch, Exide, and Flint.

The question of who constitutes a responsible party also resurfaces in the comparison of Porter Ranch and Exide. The Porter Ranch gas leak represented a private sector failure. In the case of Exide's contamination, California allowed the company to operate for 30 years on a temporary permit and with out-of-date air pollution standards, even after multiple environmental violations (LA Times, 2016). In the wake of contamination exposure, the government dismissed community claims and has continued to act with less of a sense of urgency than it did to the Porter Ranch leak.

While no two crises are exactly the same, the critical point is that government accountability and the dominant collective identity of a community have the capacity to shape government responses to industrial and technological failures. A community's economic well-being and average income, predominant racial makeup, average age, geographic location, and political clout—what I would refer to as a community's intersectional identity—can influence the level of responsibility, accountability, and standards that governments and industries are held to during such crises.

Through the lens of color and class

This is, in fact, not new. Findings in environmental justice research demonstrate the extent to which low-income communities and communities of color are burdened with uneven levels of exposure to environmental harms (Bul-

lard 2005; Pellow 2000; Crowder and Downey 2010). Bullard (2005) demonstrates this by tracing the efforts of five African American communities working to tie social justice and environmental issues together to highlight cases of environmental injustices. Brugge et. al. (2006) compare incidents of uranium release: the 1979 United Nuclear Corporation's Church Rock, N.M. uranium mill, the 1986 Sequoyah Fuels Corporation near Gore, Okla., and the 1979 nuclear meltdown at Three Mile Island in Dauphin County, Pa. The researchers suggest that Church Rock and Sequoyah received far less attention because they occurred in rural, low-income native communities, whereas Three Mile Island was a wealthier community. Furthermore, neither Church Rock nor Sequoyah led to major policy reform for better protection (Brugge et al. 2006). These disparate patterns persist. Following a 2008 coal ash spill near the predominantly white community of Kingston, Tenn., the coal ash was transported and dumped in the predominantly black and lower-income community of Uniontown, Ala. In 2013, Uniontown residents filed a civil rights complaint with the EPA against the Alabama Department of Environmental Management for the department's permitting actions that they contend resulted in racial disparity in public health risks (Rushing, 2016).

Such disparity appears not only in the aftermath of these tragic events. We know that disaster events often magnify vulnerabilities and inequalities that exist in communities before the onset of disaster. There are disparities in community preparedness, regulations and regulatory enforcement, and prevention and mitigation efforts. And from environmental justice research we know that some community members are more equipped with the resources, political clout, and cultural capital to resist exposure to environmental harm (Brady, Verba, and Schlozman 1995, Morrison and Dunlap 1986, Parker and McDonough 1999). Sociologist Annette Lareau's work on concerted cultivation underscores how class and race lines influence our ability to successfully navigate the world of authority and bureaucracy, which likely play a role in a community's ability to successfully resist proposed locations for industrial activities (McKenna, 2012). In her Uniontown testimony, Esther Calhoun makes this point clear: "Why did Uniontown become the dumping ground for the eastern half of the country, and then why did it become the dumping ground for coal ash? No one thought that the members of this poor community would fight back or that anyone would listen to us" (Calhoun, 2016).

Beyond Flint: lessons learned and directions forward

What we can take away from the host of environmental harms illustrated above is that attempts to address them are failing in a few critical ways. First, there is a lack of appropriate investment in rebuilding and retrofitting infrastructure, coupled with lax regulatory oversight and enforcement to help prevent these environmental crises. Second, where government investment in infrastructure and well-enforced industrial regulations exists, they exists selectively and unevenly. Finally, when a disaster does occur, government culpability and the predominant makeup of a community, among other things, contribute to disparate disaster response.

Social scientists need more systematic, detailed comparative case studies of technological failures to explore the relationship between community identity and government responsibility and accountability from preparedness to response and recovery. More attention should be paid to the environmental justice roots that precede technological failures, the disproportionate impacts of these failures, and the unequal responses to them by both the media and government entities. Public officials and their staff need to incorporate the well-established literature on the disparity of environmental harms and disaster vulnerability into policies that generate equitable government responses in all communities, but particularly in communities that have faced decades of environmental injustices. There are Congressional efforts to create equal funding opportunities for states with water quality issues to improve infrastructure, but the problem is that funding eligibility is contingent upon the declaration of a public drinking water state of emergency, not simply the first sign of failing infrastructure or water contamination (Semuels, 2016). It is irresponsible to delay fund for infrastructural repair until the situation digresses to a point of a state of emergency.

This proposed plan for water contamination may benefit communities that are currently suffering, but the focus on post-emergency response in the bill is still problematic.

Anti-nuclear protest following the Three Mile Island accident, Harrisburg, 1979. © National Archives and Records Administration (NARA

To address these environmental harms and inequalities, scholars, industrial operators, public servants, and citizens must work together to identify potential harms and injustices pre-emergency, and address them through preventative, precautionary regulations that are effectively enforced to mitigate risk, as opposed to post-disaster reactionary policies.

If Americans are committed to the notion that all lives matter, that all communities matter, the nation cannot value the health and well-beingof one community at the expense of another

Finally, governments must remain committed to policies that redress these issues, seeing them all the way through. Unlike the withering commitment to reducing lead contamination, we can't allow responsible parties—public or private—to say "good enough" and then walk away until the number of people suffering environmental harm from an incident is reduced to zero. This is particularly critical when those who suffer are disproportionately affected on the basis of age, gender, race, income, and status.

If Americans are committed to the notion that all lives matter, that all communities matter, the nation cannot value the health and well-being of one community at the expense of another. We must strive to reduce environmental harms, but the central focus must be to do so equitably.

REFERENCES

Brady, Henry E., Sidney Verba, and Kay Lehman Schlozman. 1995. "Beyond SES: A Resource Model of Political Participation" *American Political Science Review* 89 (2): 24.

Brugge, Doug, Jamie L. delemos, and Cat Bui. "The Sequoyah Corporation fuels release and the Church Rock spill: unpublicized nuclear releases in American Indian communities" *American Journal of Public Health* 97.9 (2007): 1595-1600.

Bullard, Robert. 2005. "Environmental Justice in the 21st Century" *The Quest for Environmental Justice: Human Rights and the Politics of Pollution*, edited by Robert J. Bullard. Sierra Club Books.

Bullard, Robert. 2000. *Dumping in Dixie: Race, Class, and Environmental Quality*, 3rd Edition. Boulder, CO: Westview Press.

Calhoun, Esther, "An Alabama Town's Toxic Crisis – Over Coal Ash" Savannah Now, February 14, 2016. http://savannahnow.com/column/2016-02-14/esther-calhoun-alabama-towns-toxic-crisis-over-coal-ash# (accessed April 15, 2016).

Crowder, Kyle and Liam Downey. 2010. "Inter-Neighborhood Migration, Race, and Environmental Hazards: Modeling Micro-Level Processes of Environmental Inequality" *American Journal of Sociology* 115(4): 1110-1149.

Duara, Nigel, "How the Gold King Mine spill continues to affect Navajo life" Los Angeles Times, November 25, 2015. http://www.latimes.com/nation/la-na-ff-navajo-qa-20151125-story.html (accessed on April 15, 2016).

Fournier, Ron., "Snyder Concedes Flint His "Katrina," a Failure of Leadership" *The Atlantic*, January 18, 2016 http://www.theatlantic.com/politics/archive/2016/01/snyder-concedes-flint-is-his-katrina-a-failure-of-leadership/463068/ (accessed on April 15, 2016).

LA Times. 2016. "Why does affluent Porter Ranch get more urgent environmental relief than working-class Boyle Heights?" *Los Angeles Times*, January 29, 2016. http://www.latimes.com/opinion/editorials/la-ed-exide-20160131-story.html (accessed on April 15, 2016).

McKenna, Laura. 2012. "Explaining Annette Lareau, or, Why Parenting Style Ensures Inequality" *The Atlantic*, February 16, 2012. http://www.theatlantic.com/health/archive/2012/02/explaining-annette-lareau-or-why-parenting-style-ensures-inequality/253156/ (accessed on April 15, 2016).

Morales, Laurel. 2016. "For the Navajo Nation, Uranium Mining's Deadly Legacy Lingers" *NPR*, April 10, 2016 http://www.npr.org/sections/health-shots/2016/04/10/473547227/for-the-navajo-nation-uranium-minings-deadly-legacy-lingers (accessed on April 15, 2016).

Morrison, Denton E., and Riley Dunlap. 1986. "Environmentalism and Elitism: A Conceptual and Empirical Analysis" *Environmental Management* 10 (5): 581-89

Parker, Julia Dawn, and Maureen H. McDonough. 1999. "Environmentalism of African Americans: An Analysis of the Subculture and Barriers Theories" *Environment and Behavior* 31 (2): 155-77.

Pellow, David N. 2000. "Environmental Inequality Formation: Toward a Theory of Environmental Injustice" *American Behavioral Scientist* 43(4): 581-601.

The Washington Post. 2016. "Transcript: The Democrats' debate in Flint, annotated" *The Washington Post*, March 6, 2016 https://www.washingtonpost.com/news/the-fix/wp/2016/03/06/the-democrats-debate-in-flint-mich-annotated/ (accessed on April 15, 2016)

Young Molly, 2016. "Ex-FEMA head says Flint water crisis should have used lessons from Katrina" *MLive*, January 20, 2016 http://www.mlive.com/news/flint/index.ssf/2016/01/government_didnt_learn_from_hu.html (accessed on April 15, 2016).

Rushing, Keith., 2016 "Coal Ash Dump in Alabama's Black Belt — Another Symbol of Racism's Staying Power" *Huffington Post*, February 12, 2016 http://www.huffingtonpost.com/keith-rushing/coal-ash-dump-in-alabamas_b_9220854.html (accessed on April 15, 2016).

Semuels, Alana, 2016. "A Tale of Two Water Systems" *The Atlantic*, February 29, 2016 http://www.theatlantic.com/business/archive/2016/02/a-tale-of-two-water-systems/471207/ (accessed on April 15, 2016).

Sager, Rebekah, 2016. "Like Flint, water in California's Center Valley unsafe, causing health problems" *Fox News Latino*, March 8, 2016 http://latino.foxnews.com/latino/health/2016/03/08/like-flint-water-in-california-central-valley-unsafe-causing-health-problems/ (accessed on April 15, 2016).

Weesjes, Elke, 2016. "Weakened Resolve – Flint Crisis Hasn't Steeled the Nation Against the Health Risks of Lead" *Disaster Research*, March 11, 2016 https://hazards.colorado.edu/article/weakened-resolve-flint-crisis-hasn-t-steeled-the-nation-against-the-health-risks-of-lead (accessed on April 15, 2016).

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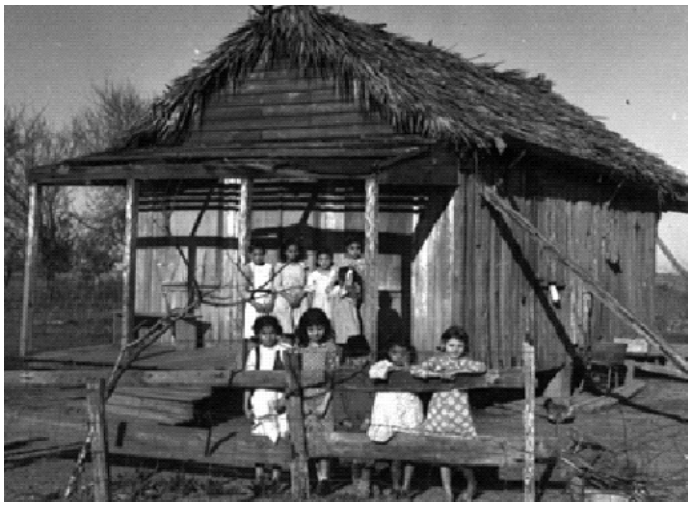

Third Time is a Charm?

The Lowlander Center and the Resettlement of Isle de Jean Charles

Q & A with Kristina Peterson

Top: Isle de Jean Charles, island home with thatched roof.
Bottom left: Isle de Jean Charles, island children.
Bottom right: Isle de Jean Charles, Island Chief Victor Naquin and wife (parents of Chief Albert Naquin) © New Deal Network 1938.

KRISTINA PETERSON, former senior research associate with the Center for Hazards Assessment Response and Technology at the University of New Orleans (UNO-CHART), is the director facilitator of the Lowlander Center, a nonprofit that supports people living in Louisiana's lowland region through education, research, and advocacy.

The Lowland Center has been closely involved with the resettlement of the Isle de Jean Charles Band of Biloxi-Chitimacha-Choctaw tribe. The tribe has been at the front lines of Louisiana's coastal land loss—the land it has inhabited for generations is vanishing before their eyes. In the past century, Isle de Jean Charles has been shrinking and today only about two percent of the tribe's ancestral home is left. The tribe recently received a $48 million award from the National Disaster Reduction Competition (NDRC) sponsored by the U.S. Department of Housing and Urban Development (HUD) and the Rockefeller Foundation.

"This award will allow our tribe to design and develop a new, culturally appropriate and resilient site for our community, safely located further inland," the Chief Albert Naquin was quoted as saying on the Lowlander Center Web site.

Together with a team of nationally recognized indigenous and non-indigenous professionals, the people of the Lowlander Center are assisting with the tribe's relocation process farther inland, which they hope will become "a living model of community cultural resilience, disaster and climate change mitigation, green building practices, environmental stewardship, and sustainable economic development (Lowlander Center, 2016).

I recently spoke to Peterson by email about the center and its involvement in the tribe's pioneering relocation efforts.

Q: The Lowlander Center is a nonprofit that was founded in 2012. How did the center come about?

A: The coast of Louisiana and its amazing people are challenged by the fastest disappearing delta in the world. This

Isle de Jean Charles after Hurricane Gustave 2008 © Karen Apricot

challenge is complex in that it impacts historied communities of place that have been stewards of the estuaries—their "life world." The Lowlander Center was formed to team up with the various coastal communities, indigenous and non-indigenous, to support their efforts to continue to thrive in the face of the many challenges. Some communities are focusing their efforts on remaining in place, while others such as Isle de Jean Charles, have come to the difficult decision that moving further inland is their only option. The Lowlander Center and its board members have a long history of partnership with Isle de Jean Charles and have supported Chief Albert Naquin's efforts to identify resources and partners for their resettlement effort.

Q: The team of Isle de Jean Charles and the Lowlander Center have created a new Web site about the resettlement of the Band of Biloxi-Chitimacha-Choctaw Indians. What do you hope to achieve with this Web site?

A: We would like to tell the story of the incredible work and history of the Isle de Jean Charles Tribe and their courageous work to step out in uncharted territory—climate resettlement. To do justice for a "to a seventh generation community"[1] that serves the people of the tribe and the eco-system that supports them, a very holistic and integrated approach has to be taken. We are hoping that the site will help provide a platform for people to learn in real time what going on with the tribe's work and to link this work with others who are being challenged, nationally and internationally, with resettlement.

Q: Isle de Jean Charles has lost the majority of its land and population to coastal erosion and rising sea levels in the past 100 years. In January, the tribe received $48 million for resettlement. How difficult was it to obtain this funding and what can other tribal communities—for example, those in Alaska—learn from the Isle de Jean Charles tribe?

A: The funds involve resettlement but are fundamentally geared towards developing an exemplary sustainable, resilient coastal community that will stand the test of time. This was the goal of HUD's National Disaster Resiliency Competition that awarded the funds. The resettlement becomes a proof of concept in using best technologies, best practices, and the best knowledge of process for human dimensions in cultural retention and lifeway[2] transfer. The community will be a teaching center for other communities that want to apply mitigation measures and to understand the complexities of resettling in context with changing eco-systems—and in some cases rapid social and lifeway threats. The team that led the application efforts partnered with the tribal council and the community to , engaged in an in-depth planning effort, compressed into a brief timeline in a short amount of time. Community engagement in the process is also an element of the best practices that are being implemented. There were many challenges associated with completing the application, particularly in a way that made it both competitive and culturally appropriate. When it comes to proposal development, small communities and non-profits are at a disadvantage compared to large consulting firms. However, we had the benefit of a wonderful team of local and national supporters who were willing to share their extensive expertise in support of the tribe. And the tribe contributed their commitment to participating in numerous meetings, often having to take time from their employment to do so.

Q: What are the biggest challenges that lie ahead for the Isle de Jean Charles Tribe?

A: Although the grant has been awarded, the tribe has not yet received the grant nor do they know under what conditions they will be receiving the monies. The grant will be given to the State [of Louisiana] directly and the state's negotiations with HUD regarding the details have not been transparent. The team that worked on the proposal for two years is a mixture of experts from both the tribe and from relevant disciplines. The trust that has been built during that time period is reflected in the quality of design that, in turn, reflects the cultural, economic, and continued growth of the tribe. The benefits are a projected, long-lived community that can re-gather a people who have been scattered by former storms and disasters. The re-gathering serves to strengthen traditional mutual aid, community self-sufficiency, and agency. At the same time, the process of leaving the island is a difficult and complicated emotional journey for community members who have slowly watched their land erode from under them for so long.

Q: $48 million for the resettlement of 400 tribe members doesn't seem quite enough. Or is it?

A: The community will be learning through the evaluation process. They are the best folks to help interpret the work for others. Between the proof-of-concept design, the complex evaluation process for transferability and the need for a minimum of 100 homes, $48 million is not enough.

1 Seventh Generation is an indigenous concept that understands that all of creation has to be stewards of the resources for seven generations in the future or in perpetuity.

2 Lifeway is a word that Kyle Whyte is using in lieu of culture in that many people understand culture as very limited whereas lifeway encompasses all of what we do as a people.

Additionally, resettlement entails far more than building houses, as biodiversity must be returned to the new land, infrastructure installed, and economic livelihoods insured. It is important to remember that what is being created is a prototype that will explore various applied mitigation strategies that could be beneficial for a resilient coast. When developing prototypes or proof-of-concept pieces, some applications may be more expensive up front, but allow for the testing of new green, resilient building materials and building designs that could offer savings not only to the immediate location, but also can result in future savings that can be transferred to other communities and building standards. There is a need for a layered approach to evaluation methods that allow the team to understand the intersection of physical, social, and political forces so that appropriate measures can be formed to mediate obstacles.

Q: Twice before, in 2002 and 2009, the tribe voted in favor of relocation, yet it wasn't realized. What happened?

The tribe has discussed the need for resettlement for 16 years. The first time this was discussed, the [U.S. Army] Corps of Engineers wanted the tribe to have 100 percent buy-inparticipation in order to give them the funds to resettle. The tribe had 85 percent buy-in at the time and could not meet those qualifications. The second attempt was met with not-in-my-backyard resistance by the neighbors in the proposed location. The surrounding community was able to prevent the sale of the property. This is the third attempt of the tribal council to resettle the community. It is imperative in that their homeland is quickly disappearing and the close family/community support systems are being strained by the dislocation of individual families.

Q: How will the Isle de Jean Charles tribe protect itself from future disasters in its new location in Terrebonne Parish, South Louisiana?

A: The first facility the community would like to build when they are able to acquire land is a community facility that can serve as a hurricane and tornado shelter. The [Federal Emergency Management Agency]-rated shelter will serve the Tribe in the next storm, as well as a neighboring tribe, the Pointe au Chien, thus keeping family and community together in a safe spot. The tribe, using a permeable playfield surface design that can double for campers, will be able to house families that would potentially be displaced during the next storms and keep them in the context of the community until their homes are built in the new location. There is a potential disconnect between now and when homes can be built and the possibility of a devastating storm.

The over-all design of the community brings together all the best practices in water usage, mitigation measures, energy and self-sustainability. The tribe, once an extremely self-sufficient people, will be able to regain a new level of self-sufficiency with indigenuity (indigenous ingenuity) that can serve as a new coastal standard.

Q: What is next for the Lowlander Center and for you personally?

A: We would like to see this come to fruition, learn from what we did with the tribe, and enjoy the outcome with our friends. We also want to continue the work with other communities that are imagining their resilience or adaptation a bit differently than Isle de Jean Charles and learn from their efforts. For me personally, I want to continue to explore the need for designated, set-aside lands held for future community relocations. Just as national forests are used for economic and resource protection by protecting natural areas, we may need to explore policies that will develop "green lands." These lands could be used for environmental or green services that counter negative climate impacts, while keeping them open for future community development.

Chief Albert Naquin

Kristina Peterson has worked closely with Chief Albert Naquin of the Isle de Jean Charles Band of Biloxi-Chitimacha-Choctaw tribe. I spoke to Chief Naquin via email and asked him for some additional feedback about the tribe's resettlement:

Q: What are the pros and cons of the move? In other words, what will you gain and what will you lose?

A: While we are losing the land and the community our ancestors built for us, moving to a new site means that we are able to reunite the tribe (due to erosion many people were already forced off the island, scattering tribal members all over the region), maintain and foster our culture, move into homes that are not contaminated, and create an overall much safer living environment. Other than losing our land, we have everything to gain.

Q: How do tribal members feel about the move?

There are certain people who do not want to move. Others feel excited and some feel sad, but I think most people feel both excited and sad at the same time.

Q: Receiving the funds to move is quite a milestone, but it is only the start. What challenges lie ahead of you?

A: We didn't actually receive any funds yet. The award went to the state and our biggest challenge right now, is to make sure that we get what we were awarded by HUD.

Losing Place and Losing Hope

Newtok's Challenging Journey to Higher Ground

By Elke Weesjes - All photographs © 2009 Phil Daquila

THE ALASKA NATIVE TOWN of Newtok is expected to be under water by 2017, according to the Army Corps of Engineers (U.S. Army Corps of Engineers, 2009). The town is hardly an exception; there are eleven other tribal communities in the Arctic Circle that are in the same predicament (GAO, 2009). However, it is unlikely that these towns will be able to move to higher ground any time soon without the creation of a federal framework that can assist, overlook, and fund their relocation.

In the past 60 years, winter temperatures in Alaska have increased as much as six degrees Fahrenheit (EPA, 2016). As a result, arctic sea ice is decreasing in size and thickness and permafrost is thawing. This, in turn, has accelerated erosion and flooding, destroying local infrastructure and threatening the livelihoods of thousands of people—particularly Alaska Natives who live in the most vulnerable coastal areas of the Arctic Circle.

In order to shine a spotlight on these devastating impacts of climate change, President Obama traveled to Alaska in September 2015. On the third and final day of his trip, he traveled to two coastal towns in southwestern Alaska—Kotzebue and Dillingham—becoming the first president to visit Arctic Alaska. The town of Kotzebue (pop. 3,201) has been battling the impacts of climate change for years. Its main road runs right above the Kotzebue Sound—an arm of the Chukchi Sea—and is especially vulnerable to coastal erosion and arctic storms.

While in town, Obama took a tour of the Shore Avenue Project, a multi-year initiative to guard the city's coastline against erosion.

"[The project] has protected the roadway and was paid for, in part, with federal transportation funds," Obama wrote in his closing thoughts. "It's a reminder of exactly why we fight so hard for infrastructure spending. It's for communities like these" (Obama, 2015).

For many coastal communities in the same region, however, it is too late for erosion prevention and restoration efforts. The only adaptation strategy that can protect these communities from accelerating climate change is the relocation to higher and more solid ground. Unfortunately, while government agencies are spending millions of dollars on projects such as the Kotzebue Shore Avenue Project, there is an absence of funding for relocation efforts. According to Robin Bronen, an Anchorage human rights attorney and author of several reports on the situation in Newtok, this is rooted in the fact that U.S. climate change policy is primarily focused on helping victims rebuild in place after a disaster rather than moving whole communities out of harm's way. As such, Bronen argues, there is no designated federal entity to guide, coordinate, or fund the relocation of villages. As long as government agencies are unable to change their approach from protection in place to relocation,[1] these communities won't be able to protect themselves from further impacts (Bronen, 2013; Bronen and Chapin, 2013).

Already in 2009, a report by the U.S. Government Accountability Office (GAO) concluded that out of 200 Native Alaskan coastal villages, 31 face imminent threat. At least 12 of the 31 voted to relocate (GAO, 2009)

Newtok

One of the villages that has opted to move to higher grounds is Newtok, a settlement of about 450 members of

1 According to Bronen, current federal disaster response legislation, the Stafford Act and its amendments, require that funding be spent on repairing and rebuilding in the original location of the disaster. This means that communities whose location is no longer habitable, or that are located entirely within floodplains, are unable to receive government funding to repair and rebuild.

the Yup'ik people located along the Ninglick River near the Bering Sea in western Alaska (Newtok Village, 2015)

Since the mid-1950s, Newtok has lost about three-quarter of a mile of tundra that separated the town from the Ninglick River. A 1983 Ninglick River Erosion Assessment (requested by the City of Newtok and funded through the Alaskan Legislature) determined that between June 1957 and May 1983, the north bank of the river had eroded at an average annual rate of 19 to 88 feet, and that if this process isn't slowed down, community structures would be endangered within 30 years (2013). Woodward Clyde, the consultants that were hired to prepare the 1983 assessment, concluded that, "relocating Newtok would likely be less expensive than trying to hold back the Ninglick River" (State of Alaska, 2016i).

About ten years later, in response to the town's worsening erosion problem, the Newtok Traditional Council—the town's leadership—initiated a relocation planning process. After analyzing six different sites, it agreed on a new location—a site elevated on bedrock about nine miles south from Newtok across the Ninglick River. Newtok residents were already familiar with this site. Through the 1960s, residents spent summers in fish camps in Mertarvik—Yup'ik for "getting water from the spring"—while wintering in Newtok. After years of lobbying, Newtok finally got the title to Mertavik in 2003 (Community of Newtok and the Newtok Planning Group, 2011).

As Newtok was busy with its relocation efforts, the loss of land continued. When the Ninglick River overtook the Newtok River in 1996, the land buffer between the town and the Ninglick was lost, leaving Newtok even more susceptible to storm surges and flooding (Rawlings, 2015).

Between 2002 and 2013, seven floods—including six federally declared disasters—further accelerated erosion. The impacts of these floods were enormous. Water supplies were flooded, raw sewage was spread throughout the community, residents were displaced, subsistence food storage was destroyed, and essential utilities were shut down (Newtok Village, 2015).

Since being partly absorbed by the Ninglick River, the remaining Newtok River turned from a free flowing stream into a slough. As a result, the town's waste (Newtok does not have running water and waste is disposed of in the river) is no longer able to flow out properly to the sea, creating a serious public health threat to the community.

Nearly 30 percent of infants in Newtok were hospitalized with lower respiratory tract infections between 1994 and 2004, including respiratory syncytial virus and pneumonia, according to a 2006 study conducted by the Yukon Kuskokwim Health Corporation and the Alaska Native Tribal Health Consortium. These infections have been linked to the substandard sanitation conditions, including inadequate potable water for drinking and personal hygiene, human waste contamination, and household overcrowding.

The report concluded that these conditions "appear to result from an initial lack of infrastructure development and failure to properly maintain existing infrastructure" (Community of Newtok and the Newtok Planning Group, 2011).

Piecemeal funding and red tape

While the rapid deterioration of Newtok's facilities and infrastructure has adversely impacted the quality of life, relocation is still a long way away. In fact, not much has happened since the town obtained the deed of Mertavik twelve years ago. Delays in relocation efforts are primarily the result of piecemeal funding and extraordinary amounts of red tape. The Newtok Traditional Council is

working with approximately 25 different federal and state government agencies to build the infrastructure and housing at their new site (Bronen, 2013).

For example, in 2007, the first three homes in Mertavik were constructed using grants from the Bureau of Indian Affairs (BIA) Housing Improvement Program (HIP). A year later, Newtok received $3.3 million in state aid, which enabled tribal leaders to begin building a barge landing at the new site to bring in building materials. In addition, this money was used to design and construct some of the road that leads from the barge landing to the yet to be half-completed evacuation center (which was partially funded in 2009). In 2011, Newtok received grants for three additional homes, two through the Association of Village Council Presidents (AVCP) Regional Housing Authority and the third from BIA. These three homes were constructed in 2012. In short, it took more than five years to built six homes, the foundation of an evacuation center, a piece of road, and a barge landing. And these were the most productive years since Newtok obtained the title to Mertarvik. Dozens more homes need to be built and Newtok is rapidly running out of time.

Securing further funding for the construction of new homes is critical to the success of the relocation. In 2014, a engineering survey of the 78 occupied housing units in the village of Newtok identified that only twelve were structurally sound and could be relocated to Mertarvik.

Through the Federal Emergency Management Agency (FEMA) Hazard Mitigation Grant Program (HMGP), Newtok received funding to relocate these twelve homes. It qualified for funding because the 2013 flood that devastated much of the town was declared a federal disaster, which is one of the program's requirements. FEMA awarded the first phase of this grant, which enabled the State of Alaska to hire a contractor and engineer. The second phase of the grant will be awarded after an environmental review of the project is completed. The actual relocation of the twelve homes will most likely take place in the summer of 2017, according to the state Web site (State of Alaska, 2016).

While an achievement in its own right, moving these 12 homes will mean that there are 18 homes in Mertarvik. Leaving an additional 50 families uncertain about when they will be able to move to higher ground.

Residents, once hopeful, are unsure if they will ever relocate.

"We've been waiting so long. I don't know," Newtok resident Jimmy Charles told the *Atlantic*. "I'm beginning to lose a little bit of hope" (Semuels, 2015).

Funding hurdles

While Newtok was able to get a small amount of FEMA funds though its Hazards Mitigation Grant Program, most of its relocation projecst do not meet the requirements to participate in the agency's grant programs. Besides HMGP, the Pre-Disaster Mitigation (PDM) grant program and the Flood Mitigation Assistance (FMA) program are available to the State of Alaska and Alaska Native villages.

The PDM grant program is designed to fund communities' nationally competitive mitigation projects and planning efforts. Funding through this program doesn't have to be triggered by a presidential disaster declaration (unlike the HMGP). However, one of the requirements is that all projects submitted must be cost-effective and techni-

cally feasible. While most of Newtok's individual relocation projects are technically possible, they are far from inexpensive thanks to the cost of flying or shipping materials to Mertarvik—especially since the new site has no infrastructure in place. FEMA estimated that moving Newtok could cost around $400 million in total (Miller and Murphy, 2013). These high construction and relocation costs, in combination with Newtok's low population, means that most projects are disqualified for a lack of cost effectiveness (Miller and Murphy, 2013; Rawlings, 2015).

The FMA Program provides funding to states, communities, and tribes for developing flood damage reduction projects, such as the elevation and relocation of structures. However, recipients must participate in the National Flood Insurance Program (NFIP) and have a flood mitigation plan. Unfortunately unincorporated villages such as Newtok can't participate in the NFIP and are unlikely to have any homeowner or flood insurance, considering the town's precarious location (Rawlings, 2015).

The HMGP has similar cost-effectiveness requirements as the PDM grant program, although funding is only available following a federal disaster declaration. Unfortunately, such declarations have never been honored for erosion—Newtok's biggest threat (Rawlings, 2015).

Another hurdle is the cost share requirement of FEMA programs. All three programs stipulate that a state or a tribe match up to 25 percent of the total costs with FEMA. While the State of Alaska would provide the required 25 percent of the HMGP, it won't do the same in the case of PDM and FMA grants, leaving tribes to assume 10 to 25 percent of project costs (Miller & Murphy, 2013).
It is unlikely that Newtok could raise even a 10 percent contribution.[2] The town, like numerous other small Native Alaskan settlements, is built on a subsistence economy and lacks a monetary surplus for big investments, such as infrastructure or community buildings. Furthermore, according to the 2010 census, more than 30 percent of residents live below the poverty line (Newtok Village, 2015).

Forced to settle permanently

In order to maintain their subsistence lifestyle, Alaska Native communities used to move around between a number of hunting and fishing camps. This migratory lifestyle came to an end in the late nineteenth and early twentieth century when the U.S. Bureau of Education required that all Alaska Native children to attend school. The locations of these schools were largely determined by barge accessibility that allowed the transport building materials. Infrastructure and other buildings sprang up around these schools, creating permanent settlements. By the mid-twentieth century, the majority Alaska Native tribes had settled in these permanent communities and could no longer adapt to their changing environment through traditional migration patterns (Bronen, 2013).

The school in Newtok was built in 1958, although high school students were required to travel to Bethel, St. Mary's, or Anchorage for their education. About twenty years later, a high school was constructed in Newtok (Barnhardt, 2001).

2 The PDM standard cost share division is 75 percent federal and 25 percent tribal, local, state, or other contributions. However, the PDM also offers a 90/10 cost share incentive to communities that meet the definition of "small and impoverished," which is determined by criteria addressing community population, per capita income, and unemployment rates.

Catch-22

Today, the school district won't build a new school in Mertarvik until 25 families live there, but no families want to live there without a school. Similar population thresholds must also be met to trigger funding for an airport and mail service (Community of Newtok and the Newtok Planning Group, 2011).

However, without a major influx of new homes and an airport, it will be difficult to convince anyone to live in Mertarvik. And without more substantial funding the town won't be able to build anything.

The catch-22 doesn't end there. While villagers are waiting to move to Mertarvik, their town continues to fall apart. The boardwalks connecting the homes are rotting and the majority of the occupied units are in poor to very poor conditions. However, because of Newtok's relocation plans, the town is largely ineligible for capital funding to improve or repair the deteriorating infrastructure and houses. It is not surprising that villagers like Jimmy Charles are losing hope and patience (DeMarban, 2013).

A comprehensive relocation framework

In a video recorded just before his visit to Alaska, President Obama said, "What's happening in Alaska isn't just a preview of what will happen to the rest of us if we don't take action. It's our wake-up call" (The White House, 2015).

While his attempt to shine a light on the situation in Alaska is admirable, these words might well rub the people of Newtok the wrong way. After all, they have been trying to take action for decades but their relocation efforts haven't been very successful thus far. It is clear that progress will continue to be painfully slow until the federal government addresses the many hurdles towns like Netwok face in their efforts to relocate.

A step in the right direction would include a number of modifications of and additions to the FEMA grant programs available to tribes in Alaska. For example, in her discussion of erosion-induced displacement in Newtok, attorney Ashley Rawlings suggests that there should be a cost-sharing exception for tribes so they can become eligible for grants that have such requirements (2015). Furthermore, Rawlings calls for an amendment of the Stafford act to allow a community relocation grant program to be established under existing FEMA framework. This would allow communities such as Newtok to have a second option when agencies have decided that mitigation is no longer effective. A combination of the cost-sharing exemption and the relocation option would mean that tribes would have access to federal relocation funding (Rawlings, 2015).

Bronen also thinks the Stafford act should be amended. She argues that the act should include gradual geophysical processes, such as erosion, in the statutory definition of disaster. Additionally, she calls for the creation of "an adaptive governance relocation framework [that] would incorporate all of the institutional mechanisms to protect people in the places where they live and also create new mechanisms to implement a relocation process so that national, state, local and tribal governments can dynamically shift their efforts from protection in place to managed retreat and community relocation" (Bronen, 2015).

By modifying FEMA programs and creating a comprehensive relocation framework that assists with and funds

communities' relocation efforts, the United States can lead the rest of the world in regards to climate refugees, according to Bronen.

"The United States can create a model adaptation strategy that facilitates an effective transition from protection in place to community relocation that can serve as a model for governments throughout the world" (Bronen 2013).

REFERENCES

Barnhardt, Carol. "A History of Schooling for Alaska Native People" *Journal of American Indian Education*, Volume 40, Number 1.

Bronen, Robin. 2015. "Climate-Induced community relocations: using integrated social-ecological assessments to foster adaptation and resilience" *Ecology & Society* Volume 20 Issue 3.

Bronen, Robin. 2013. Climate-Induced Displacement of Alaska Native Communities. Brookings Project on Internal Displacement. http://www.brookings.edu/~/media/Research/Files/Papers/2013/1/30%20arctic%20alaska%20bronen/30%20climate%20alaska%20bronen%20paper.pdf (accessed on April, 22, 2016).

Bronen, Robin, F. Studart Chapin, III. 2013. "Adaptive governance and institutional strategies for climate-induced community relocations in Alaska" *Proceedings of the National Academy of Sciences of the United States of America*, Volume 110 Issue 23. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3677491/ (accessed on April 22, 2016).

Community of Newtok and the Newtok Planning Group. 2011. Mertarvik, a community that builds together for the safe and healthy future of Newtok. https://www.commerce.alaska.gov/web/Portals/4/pub/Mertarvik_Relocation_Report_final.pdf (accessed on April 22, 2015).

DeMarban, Alex. 2013. "Brookings: Federal funding, framework needed to help eroding villages" *Alaska Dispatch News*, January 30, 2013. http://www.adn.com/article/20130130/brookings-federal-funding-framework-needed-help-eroding-villages (accessed on April 23, 2016).atla

EPA. 2016. Climate Impacts in Alaska https://www3.epa.gov/climatechange/impacts/alaska.html (accessed on April 22, 2016).

GAO. 2009. Alaska Native Villages – Limited Progress Has Been Made on Relocating Villages Threatened by Flooding and Erosion. http://www.gao.gov/new.items/d09551.pdf (accessed on April 22, 2016)

Newtok Village. 2015. Tribal Hazard Mitigation Plan Update https://www.commerce.alaska.gov/web/Portals/4/pub/2015_Newtok_HMP.pdf (accessed on April 22, 2016).

Miller, David, and Kenneth Murphy. 2013. "Written testimony of FEMA Federal Insurance and Mitigation Administration Associate Administrator David Miller, and FEMA Region X Regional Administrator Kenneth Murphy for a Senate Committee on Homeland Security and Governmental Affairs, Subcommittee on Emergency Management, Intergovernmental Relations, and the District of Colombia field hearing titled "Extreme Weather in Alaska: State and Federal Response to Imminent Disasters in the Arctic." https://www.dhs.gov/news/2013/09/13/written-testimony-fema-senate-homeland-security-governmental-affairs-subcommittee (accessed on April 22, 2016).

Obama, Barack. 2015. "My Visit to Alaska: Closing Thoughts" https://medium.com/@PresidentObama/my-visit-to-alaska-closing-thoughts-e9528ba4e268#.hqmzcixsq (accessed on April 22, 2016).

Rawlings, Ashley. 2015. "Erosion-Induced Community Displacement in Newtok, Alaska and the Need to Modify FEMA and NEPA to Establish a Relocation Framework for a Warming World" *Seattle Journal of Environmental Law* Volume 5, Issue 1.

Semuels, Alana. 2015. "The Village That Will Be Swept Away" The Atlantic, August 30, 2015. http://www.theatlantic.com/business/archive/2015/08/alaska-village-climate-change/402604/#article-comments (accessed on April 23, 2016).

State of Alaska. 2016. Newtok Planning Group, Mertarvik Housing. https://www.commerce.alaska.gov/web/dcra/planninglandmanagement/newtokplanninggroup/mertarvikhousing.aspx (accessed on April 22, 2016).

State of Alaska. 2016i. Newtok Planning Group, Early Efforts to Address Erosion. https://www.commerce.alaska.gov/web/dcra/PlanningLandManagement/NewtokPlanningGroup/NewtokVillageRelocationHistory/NewtokHistoryPartTwo.aspx (accessed on April 23, 2016).

The White House. 2015. President Obama is Going to Alaska. Here's Why. https://www.whitehouse.gov/webform/president-obama-going-alaska-heres-why (accessed on April 23, 2016).

U.S. Army Corps of Engineers. 2009. Alaska Baseline Erosion Assessment. Study Findings and Technical Report. http://climatechange.alaska.gov/docs/iaw_USACE_erosion_rpt.pdf (accessed on April 22, 2016)

Photographer

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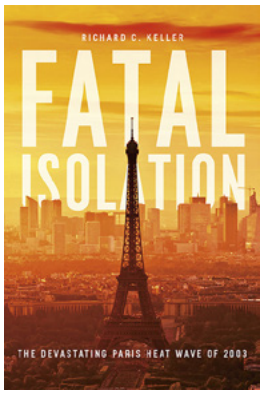


Fatal Isolation
The Devastating Paris Heat Wave of 2003

Richard C. Keller, 2015
ISBN: 9780226251110
240 pages $35.00
The University of Chicago Press

By Elke Weesjes

ANYONE WHO HAS EVER visited Paris in August knows that the French capital is unnaturally quiet in this month, as an estimated 50 percent of its residents leave for vacation. The same thing was true in the summer of 2003, although this time, upon their return, hundreds of Parisians where met with a horrid odor when entering their apartments' front doors. The source of the smell was quickly determined: decomposing corpses of people who had died of heat related causes.

In the first three weeks of that August, a heat wave struck Europe. Roughly 15,000 people succumbed to the heat in France alone, including 1,000 Parisians. The August vacation severely compounded the problem; a lack of personnel slowed the processing of the bodies, and families who were away could not claim their relatives' bodies. The backlog was so severe that Paris ran out of places to store bodies and vehicles to transport them. In response, authorities erected refrigerated tents to store and food trucks to transport the dead.

In Paris, nearly 100 bodies went unclaimed. These people had died in isolation and their bodies were only found when the smell of decomposition alarmed their neighbors.

The forgotten victims were buried in the poor section on a cemetery in Thiais, a suburb southeast of central Paris. Their social histories are central to Richard Keller's book *Fatal Isolation*. Inspired by Eric Klinenberg's study of the 1995 Chicago heat wave, Keller's book is a social autopsy of the Paris heat wave. It explores the multiple narratives of the disaster, as well as the official story of the crisis and its aftermath, as presented by the media and the state. The book also explores the life histories of the forgotten victims based on interviews with neighbors, caretakers, medical workers and landlords, as well as the scientific understanding of the disaster and its management. Although similar to Klinenberg's widely praised and groundbreaking study, Keller, a professor in the Department of Medical History and Bioethics at the University of Wisconsin-Madison, adds some historical flavor to his social autopsy by discussing Paris' social history of risk and vulnerability going all the way back to the cholera epidemic of 1849.

Keller argues that, like Hurricane Katrina in the United States, the heat wave of 2003 scarred French consciousness about disaster. It played a critical role in shaping concerns about disaster response, the ways in which meteorological catastrophes prey unevenly on different communities, and the relationship between communities and their governments.

The author covers a lot of ground, and while his analysis of the local and national response (or the lack thereof) to this disaster is important, one aspect of his study stands out as particularly interesting: how Paris's distinct architecture compounded the effects of the heat wave on the city's most vulnerable citizens.

Stuck in the attic of extreme poverty

Keller was able to trace the addresses of 93 of the 95 forgotten victims and, in order to create their social histories, interviewed their landlords, neighbors and caregivers. Through this fragmented and anecdotal evidence, Keller found out that while the forgotten lived and died in virtually every neighborhood in the city, they shared a social geography of poverty and substandard housing. Many of the victims lived in so-called chambres de bonne, former domestic servants' quarters. Keller visited a number of these apartments and was shocked by the state of most of them. Chambres de bonne are located directly beneath tin roofs of large inner city buildings, yet are usually completely separate from the apartments in the main building. They often don't have elevators and tenants—who typically are students, poor immigrant families, and the elderly—have to take narrow service staircases that are located at the back of the building up to their apartments. Some of these rooms have only cold water, and others have no running water at all. Furthermore, many chambres de bonne have a skylight while others have a single wall-mounted window, making cross ventilation virtually impossible. Because the city is unaccustomed to heat, chambres de bonne, as well as most other apartments in Paris, are very rarely fitted with air conditioners.

Keller experienced firsthand how hot these top-floor apartments get even when it isn't particularly warm outside. He describes how he visited one on a mild summer day. While the outside temperature was around 65 degrees, inside, according to Keller, it was at least 90 degrees. One can only imagine how hot it really was inside of these apartments during the heat wave when temperatures hovered around 104 degrees for weeks on end.

The author refers to these buildings as vertical geographies of class. Poverty increases as one ascends the staircase and ironically, those stuck in what anthropologist Laura Lein has referred to as the "basement of extreme poverty" are often living in the attic.

One of the people who inhabited a chambre de bonne is 80-year-old Paulette Moreau, who lived on Avenue de Friedland in the eight arrondissement. Located in an important business district, Avenue de Friedland is one of the

spokes of the star- shaped network of grand boulevards that radiate outward from the Arc de Triomphe. The avenue is lined with beautiful buildings that are classic examples of Haussmannian Paris: six- or seven-story buildings with the first floor dedicated to retail.

Keller vividly describes Moreau's living conditions. She lived in an apartment hidden behind a beautiful façade and located above several floors of spacious and luxurious apartments. The elevator, which goes up to the sixth floor, has a door in the rear as well as the front, and the upper stories have service apartments situated along a rear corridor. Residents of the top floors have their mailboxes on the sixth floor, separated from those of the main building's residents. When Keller walked up the steep and narrow staircase to Moreau's tiny single room on the seventh floor he noticed how deteriorated the corridor was: doors were covered with chipped paint, loosely hanging wires ran the length of the corridor, and the floor was littered with mousetraps. For Moreau, retrieving mail a story below her room meant navigating the dangerous staircase. Bathing meant carrying a heavy bucket from the common sink in her mouse-infested hallway. "Her final years were an assault on her dignity and a constant threat to her life," writes Keller. Moreau lived in isolation, economic deprivation kept her "lodged in a scorching apartment under the roof, and physical disability put the city and its resources out of reach." She succumbed to the heat on August 20, 2003. According to Keller, her body was never claimed and still occupies the grave in which the republic buried her.

Structural violence

Keller explains that apartments like Moreau's are sites of vulnerability for several reasons. The first and most obvious is the increased heat load of units on the upper stories of buildings. The chambres de bonne are not much more than an insulating zone for the rest of the building in both the winter as well as the summer months. Whenever it gets hot, cooling off is difficult as many apartments do not have baths or showers, and with skylights or a single wall mounted window there is little capacity for cross ventilation. Furthermore, and perhaps most importantly, the lack of social interaction with other tenants in the building means that there is a small chance of anyone discovering a problem until it is too late.

Chambres de bonne © Rafael Garcia-Suarez

The author labels the above as literal "structural violence." Structural violence is a term that was first coined in the 1960s and is used by sociologist, anthropologists and historians to refer to systematic ways in which social structures and social institutions harm or otherwise disadvantage individuals. Some examples of structural violence are institutionalized ageism, racism, nationalism, and classism. In *Fatal Isolation*, Keller makes a good case that Paris' architecture is a literal example of this phenomenon and he argues that structural violence of the city's architecture exacerbated the vulnerability of some of its least resilient citizens during the heat wave.

Lessons learned?

After the heat wave, a number of changes were introduced. Most of these changes focused on the elderly, a group identified as particularly vulnerable to heat distress. For example, the state mandated the installation of air conditioning in nursing homes. In addition, heat plans to cope with extreme temperatures have been established by health authorities who now coordinate closely with weather authorities. There are local, regional and national warning systems that emphasize the importance of solidarity with the vulnerable. Paris municipal authorities for example, have set up a telephone network designed to operate as a safety measure in periods of high heat. After registering with the city, people who worry for their health during heat waves are placed on a call list. But as the author points out, many vulnerable people do not necessarily self-identify as such. And even for those who recognize their vulnerability, "the admission that their independence is better characterized as isolation is improbable."

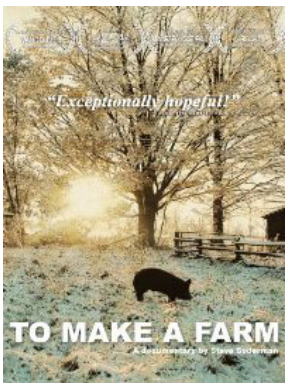
Besides the establishment of heat plans and surveillance networks, Paris is also making an effort to become a sustainable city, by reducing its environmental impact and adapting to a changing climate. These efforts are even evidenced in some of the most marginal districts in which some of the forgotten lived and died. New buildings with pitched roofs surrounded by trees and shrubs, which together help to cool the air, have popped up in the poorest neighborhoods.

Sustainable development policies represent an important step, but they mostly target new construction, leaving the majority of the urban landscape untouched. Further, the 19th century architecture is the biggest culprit, according to Patrick Pelloux, the former head of the emergency physicians' union, whom Keller interviewed.

"One thing France has not done is the renovation of housing," Pellous said. "It's very pretty, but Paris is be-

coming more and more like Disneyland. The roofs of Paris are ovens, but that is what the tourists want to see. It was this deadly charm—along with its hidden populations in its upper corridors—that made and continue to make the city so vulnerable."

The devastating 2003 heat wave will hopefully serve as a lesson not just for Paris, but for many other cities that have large vulnerable populations that live in substandard housing.



To Make a Farm
2011, 73 min.
Director: Steven Suderman

By Elke Weesjes

IN THIS 2011 documentary, Director Steven Sunderman follows five young, first-time farmers in Ontario and Manitoba, Canada. The beautifully shot To Make a Farm documents their experiences as they embark on making agriculture dreams reality. Starting from scratch, they meet the risks and challenges of this demanding profession with passion and sacrifice.

This new crop of farmers—who belong to a generation that grew up in the digital age, but favors old-school things such as farmer's markets, microbreweries, and artisan foods—have a common traits: a concern for social justice and the environment, coupled with doubt that mainstream political structures can address these issues.

At first sight, these farmers resemble the back-to-the-landers of the 1970s. Back then, millions of people in North America alone—mostly young, educated, white, and middle-class—tried homesteading on farms and in communes. These back-to-the-landers were repulsed by the value system of western society, the rat race, consumerism, and the destruction of the environment. They wanted to invent a new and better civilization in the country—self sufficient, close to nature, and far from pollution. Many, if not most, were unrealistic about what it would take to make the transition from the city to the country life. They learned the hard way that the life of a farmer is physically and financially difficult and that it is almost impossible to become independent from the mainstream economy. They underestimated the amount of money and technological knowledge necessary to set up shop in rural areas. By the 1980s, the back-to-the-land movement had disintegrated, communes and marriages had buckled under financial pressure and other hardships, and many back-to-the-landers returned to their previous lives.

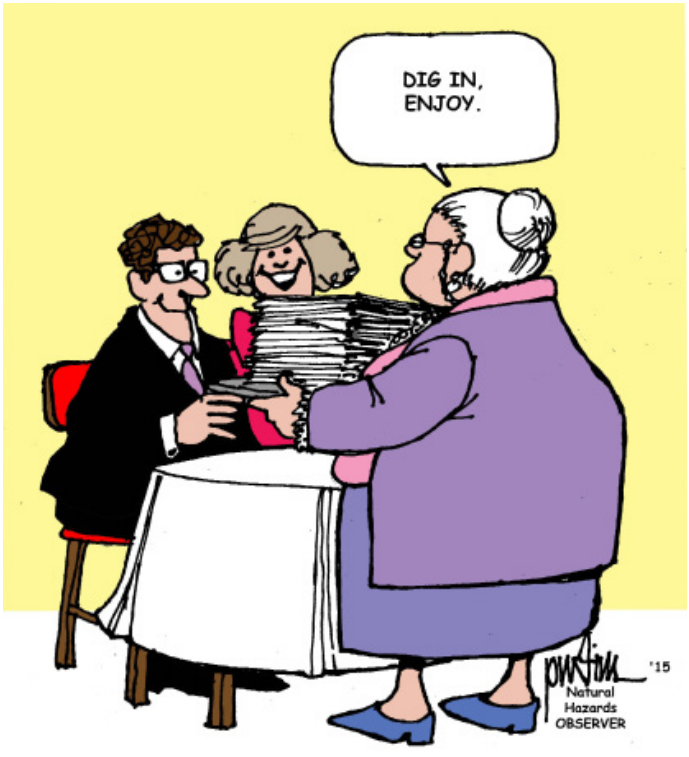
The North American agrarian community has been graying ever since. The average age of a farmer in Canada and the United States is 54 and 58 years old, respectively. Feeling dissatisfied with rural livelihoods, young adults have been moving to more populated areas for decades. But in some places in North America, that trend is reversing. Small-scale sustainable agriculture is on the rise and there is a new crop of young idealistic farmers to thank for it. Sunderman shows that, unlike the majority of their 1970s predecessors, his protagonists could have what it takes to survive on the farm—or at least survive a little longer.

Sunderman's subjects are two couples and a single man who don't have generations of agricultural knowledge to tap into. They have to learn by doing. Making money is definitely a concern for these farmers and to do so, they use the strategy of cutting out the middleman and selling directly to the customers.

We first meet Leslie Moskovitz and Jeff Boesch, owners of the 100-acre Cedar Down Farm in Hanover, who have a challenging business model. Their customers pre-order and pay for their produce even before the couple start planting in the beginning of the agricultural year. This puts them under a lot of pressure, not only to deliver fresh and delicious fruits and vegetables, but also in the right quantity. The pressure only increases when they find out that their soil is deficient in potassium.

Tarrah Young and Nathan Carey of Green Being Farm—a 50-acre organic operation in Neustadt—have a less precarious business model. They raise farm animals such as pigs, sheep, turkeys, and chickens and grow organic vegetables, which they sell to their online customers and directly to people in their neighborhood. Young, the driving force behind the operation, has a personal connection to the land and her animals. She treats her pigs and sheep like pets and confesses that she finds it hard to send them to the slaughterhouse.

In her last semester at college, Young took an introduction to organic agriculture class and was instantly sold. She explains that what attracted her most is the fact that farmers can make a real difference on environmental is-



Suderman filming To Make a Farm © Courtesy of Orangeville Road Pictures

sues, something that isn't always possible for people in other professions. She enjoys being an active participant in treating the planet well while bringing people nutritious and sustainable food.

Wes Huyghe, the last farmer in the film, experiences firsthand that growing food isn't as easy as some might imagine. He just bought two acres of land and tries to figure out how to grow vegetables with almost no equipment at all. He lives all by himself in a tent next to his land. Even the most basic tasks, like irrigating his crops, are a huge challenge. When his savings are depleted, Wes is forced to find a second job to generate some income. Just before his dream of living off the land is about to die, he finds a water well nearby that he can substitute more expensive water sources. With his irrigation problems solved, he successfully grows his first crops. His produce is a big hit with the locals who, curious to see what this bearded, long-haired man is all about, flock to his farm stand.

To Make a Farm, which was released in the United States late 2015, carefully balances these small victories with the many struggles and hardships young farmers face. Suderman makes it clear that life on the land is not for the faint-hearted—money is tight, the hours are long, there's barely time to socialize, and the work is labor-intensive. Additionally these farmers struggle with devastating weather events, such as hail, severe rainfall, drought, and snow.

Spending time with these young farmers encouraged Suderman, who himself grew up on a farm in western Canada, to reflect on his own childhood. He admits that, when he was growing up, it never occurred to him that his parents were producing food. They did not have the option to care much beyond making a profit and were forced to mass-produce standardized products that "barely nourished our bodies, never mind our souls." His parents' story didn't end well. After five generations, they were forced off the family farm by corporate competitors.

According to their respective Web sites, Suderman's farmers are all still going strong. There are a number of reasons why they have fared better—so far—than their hippy forebears. Unlike back-to-the-landers that eschewed technology, today's young small farmers are tech savvy and business wise. They have Web sites and social media accounts, which helps them increase their customer base and stay in touch with people from their past lives. This is a stark contrast to the experiences of the back-to-the-landers, who relied on word-of-mouth business and were completely cut off from mainstream society.

Another important difference between young first-time famers then and now is the today's organic-friendly consumers. Today, organic farming is big business and organic food is everywhere from supermarkets to corner stores. Back then, hippy farmers only had a counterculture movement to market to.

While it is true that small-scale sustainable farming has changed significantly and is more likely to be a successful venture—even for first-time farmers—than it was 40 years ago, the farmer's Suderman followed are still among the fortunate few. Most small farmers, organic or otherwise, struggle financially. Many are unable to survive without off-farm income. In fact, according to 2012 U.S. Department of Agriculture data, intermediate-size farms (farms that gross more than $10,000 but less than $250,000) obtain about 10 percent of their household income from the farm and 90 percent from an off-farm source. The situation in Canada is similar.

Small organic farms like those featured in the film are almost always not financially sustainable. They may be certified organic, the owners might manage soil fertility through crop rotation and avoid synthetic pesticides, and they conserve water. But these farms rely on uncompensated labor and self-exploitation. Until these farmers can get things like government funding and healthcare, their businesses can't be called sustainable and their future is uncertain.

Further reading:

Eleanor Agnew. 2005. *Back from the Land: How Young Americans Went to Nature in the 1970s, and Why They Came Back.* Ivan R. Dee Publisher, Chicago.

Natural Hazards Observer
ISSN 0737-5425
Printed in the USA.
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