Chapter 14

Disaster and Climate Change

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In the last few decades, disasters of both geophysical and technological agency have become alarmingly more frequent and severe across our planet. The effect of this unprecedented development is that ever larger numbers of people are suffering from calamitous events and experiencing escalating conditions of vulnerability. Despite all the modern advances of the current epoch, safety has not increased. It has grown worse.

Since 1998, the world has undergone Hurricane Mitch (1998); Hurricanes Katrina (2005) and Ida (2021); the Haitian Earthquake (2010 and 2021); the Great East Japan Earthquake, tsunami, and meltdown (2011); Hurricane Sandy (2012); Typhoon Haiyan (2013); the Nepalese earthquake (2015); Southeast Asia fires and smog (2015 and 2016); Britain and Ireland floods (2015–16); the El Niño and La Niña of 2016, plus their increased frequency; the Guatemalan, Palomar, and South African droughts (2016); Western United States wildfires (2000–2021); Australian drought, floods, and windstorms (2000–2020); Taiwan's Typhoon Megi and landslide (2016); yet another Mississippi flood (2016); Hurricane Matthew and the North Carolina flood (2016); the worst drought in the Levant and Middle East in a millennia (2016–17); worsening famine in Syria and Sudan (2017); along with countless other smaller-scale and less prominent happenings. All have produced significant losses in life, land, property, habitat, and homeland. While all to a certain extent have also increased the awareness and importance of confronting the risks and episodes of particular regions, the forecast is that similar dire events will accrue and amplify in the future. Storms and other sorts of incidents will grow stronger, last longer, and magnify (EM-DAT 2016).

The disturbing upsurge in disasters, and the vulnerability to them, is due in part to an age-old set of driving factors, albeit today they are often augmented. These include the inherent vicissitudes of embedded environmental features; the actions of humans on land and waterscapes; faulty intentional and unintentional manufacture, construction, arrangement, and assembly; social disparities, poverty, economic and political victimization; and stifling lack of opportunity. The former driving factors are, however, now combined with a number of critical new components, all also well documented by Eriksen in his *Overheating: An Anthropology of Accelerated Change* (2016). They include massive population growth, which has heightened penury, lack of education, marginalization, and depreciated habitat; novel and aberrant demographic processes, including massive worldwide urban migration, burgeoning and overcrowded cities, the drift of populations to coastlines, all of which are inherently hazardous; and the desire for Western lifestyles with concomitant accumulation of goods and demands. The newfangled drivers often interlace with one another. Many of the newly gargantuan cities also sit on coastlines, which are highly prone to earthquakes, tsunamis, cyclones, volcanic eruptions, floods, and mudslides. Enhanced consumerism not only consists of the desire for more goods and services, it includes a concomitant demand for energy and transportation, all of which accelerate depreciation of the environment and advance risk construction. Population movements, whether emanating from poverty, lack of land, or the desire for a better life, have often instead increased hardship, marginalization, and yet further diminished habitat.

A rampant global spread of persons bearing neoliberal agendas with their attendant, often deleterious, actions has also taken place. Heedless of ecozone and culture, aimed only at financial profit, their deeds have often included land grabs, ill-conceived construction, crop conversions, water diversions, and the exploitation of cheap local or replacement labor. Indeed, the spread of neoliberalism and short-sighted development can be viewed as its own sort of firestorm. Perhaps the strangest aspect about the expansion of neoliberalism is that it has not been confined to particular societies, nations, or companies. It so appears to have operated away from and above any of these—I have taken to calling the phenomena "a culture without a people." Its proponents do not share customs, language, homeland, or religion. They simply share an exploiting motivation. Along with their expansion has come the amplification of a dominating intermutual and synergistic economic system that has swept over political factions and subsumed a wide diversity of regions.

Finally, in part due to the above, a globalization of markets has also occurred over the last decades that entails the fabrication, trade, purchase,

and sale of products derived from one place and dispatched to a distant other. The items include clothing, cars, machine parts, toys, and, to an ever-expanding extent, food. All have led to unexpected vulnerability to calamity at both ends of the trade routes, and, in fact, all along them. Neither seller, buyer, nor middleman can see, predict, calculate, or comprehend the collapse that takes place when some unanticipated disaster occurs somewhere along the conduit half a world apart. All these new drivers have also been documented by Eriksen (2016).

One contemporary driver, however, is contributing far more than any other to the recent increased frequency and magnitude of disasters: global warming. As Edward O. Wilson states, the rise of annual mean surface temperature caused by pollution on the Earth by 2016 had already reached nearly half of the "2C" threshold above that prior to the birth of the Industrial Revolution. When global atmospheric warming pushes past this marker, Earth's weather will destabilize. Heat records now considered historic will become routine. Severe storms and weather anomalies will become the new normal. The melting of ice shields currently under way will accelerate, bringing to landmasses a new climate and new geography (Wilson 2016: 65–66).

As a consequence, major and minor catastrophes befalling human communities everywhere will simply rise. The process has begun. Warmer seawater is and will generate more ocean-originating cyclones and hurricanes, which upon making landfall will flatten ever larger areas, often populated. Rising sea levels and soaring tides are creating extensive seawater incursions and coastal erosion. Increasing heat inland has caused tornados, once confined to a well-defined "alley," to advance well outside their old corridor to manifest in previously unscathed locales. Rivers are swelling, breaking channels, finding new paths, and inundating previously secure towns as they recently did in North Carolina. Hillsides and mountains will crumble and careen over human concourses as snowpacks, torrential rains, saturation, unstable embankments, and upslope conditions increase. Slow-onset catastrophes like drought and desertification will spread drastically, bringing with them dearth of water, starvation, and abandonment. Heat will kill. Violent snowstorms and cold spells will prove devastating. Some believe destructive earthquakes and volcanic eruptions with their devastating ash and lava deposition might also be connected to climatic changes as Earth's increasing atmospheric temperature disturbs fault lines (McGuire 2016).

Those disasters generally termed "technological" will also increase. Factories and installations that produce or use toxicants and lie on coasts or fault lines will become unstable and unfurl contaminants, as the Fukushima Daiichi nuclear plant did in 2011. Hazardous manufacturing struc-

tures located in drought, inundation, or avalanche zones will potentially fissure. Proper maintenance of dangerous facilities will likely decline as regions suffer climate impacts, causing yet more soil and groundwater contamination. Lethal epidemics, like Ebola, swine flu, or COVID-19, which also fall into the domain of disasters, will also conceivably increase. They, too, generally have human action at their genesis, usually some sort of animal-to-human or insect-to-human contact, and further human interaction fans them outward. With global warming, the migration of vectors and carriers will increase (Lafferty 2009). Finally, storms and calamities will bring about far more displacement of human populations seeking new places to settle. The new locales and communities may well be equally or more vulnerable and will create still larger numbers of imperiled people. The process of climate change resettlement has already begun. In future, it will affect legions of persons in myriad locales, causing innumerable economic, political, social, and psychological dilemmas (Oliver-Smith 2009).

Definitions and More

In order to illuminate the unequivocal connection between climate change and disaster, it is necessary to clarify exactly what a disaster is. While most climate change researchers acknowledge that the changing global conditions will cause more catastrophes, few have actually examined what constitutes one. Nor have many considered the pertinence of anthropology in dealing with either, yet anthropology has recently come to the forefront in both the climate change and disaster fields. The emergence has occurred in large part due to the realization that the reason so many climate change adaptation programs and disaster reduction efforts have proven ineffective is that the people's culture, their local knowledge, lifeways, and desires, has not been considered. As a result, anthropologists and the anthropological perspective have become more and more integrated in climate change and risk reduction endeavors today.

In following, then, the first basic tenet in understanding disasters is that there is no such thing as a natural disaster. Paralleling the famous rhetorical saying "If a tree falls in a forest and no one is there, does it make a sound?" in terms of disaster, if there are no people in some way involved, an event would just be an evanescent and unrecognized happening. The statement, however, implies more than just the presence of people. Disasters all involve some form of human interaction at one level or another. The maxim is acknowledged in every field dealing with disaster, from geophysics to engineering to social science, and applies equally to those disasters emanating from climate change as well as other sorts.

There may be natural "triggers" to disasters, but it is what humans did, or chose, or made that results in a catastrophe, even those erroneously called "natural" and clearly technological ones (Squires and Hartman 2006). People have placed themselves in a certain spot. They have altered things or built things in a manner that is perilous. They have acknowledged the embedded characteristics of their environment, the modifications they have made of the environment, and their structures, or they have disregarded them.

Having started with that fundamental principle, let me define what a disaster is: "a process/event combining a destructive agent/force from the physical, modified, or built environment and a population in a socially and economically produced condition of vulnerability that results in the disruption of social needs for physical survival, social order, customary satisfactions, and meaning" (Hoffman and Oliver-Smith 2002: 4). As the definition points out, disasters take place through the conjuncture of two essential factors: a human population and a potentially destructive agent. Neither of these is static. Disasters do not arrive suddenly out of the blue, nor are they mysterious. The factors leading to them evolve over time. Disasters may give the impression that they are demarcated in exact time frames, like the moments of an earthquake or days of a flood, but that is never the full story. Disasters are processual phenomena. They have history and chronology, sometimes quite extended. They have amassed over years, decades, even centuries (Oliver-Smith and Hoffman 1999; Hoffman and Oliver-Smith 2002).

Of course, the intersection of a destructive agent and a human population does not necessarily cause a disaster. Disasters require yet another factor, the third one mentioned in the definition. Disasters take place only in a context of vulnerability. Vulnerability, or the state of being open to injury, is also historically and socioculturally produced. It comes about through the location, infrastructure, sociopolitical organization, and production and distribution systems of a society, and also its ideology. A people's vulnerability is, in fact, such a core ingredient of disaster that it is not merely causal. It conditions the behavior of individuals and organizations throughout the unfolding of the entire disaster scenario, from construction to event, recovery, and possible future mitigation, far more profoundly than the physical force of the destructive agent will. Considering its totalizing influence, and how with global warming it is advancing across more and more populations, vulnerability stands as the key factor in the link between climate changes and disaster (Fiske et al. 2014; Oliver-Smith and Hoffman 1999; Hoffman and Oliver-Smith 2002).

The definition of disaster can also not be entirely separated from the concomitant matter of hazard, another ingredient on the upswing as the

climate changes. A hazard can be defined as "the forces, conditions, or technologies that carry a potential for social, infra-structural, or environmental damage. A hazard can be a hurricane, earthquake, or avalanche. It can also be a nuclear facility or a socio-economic practice, such as using pesticides. It can also be an eroding river bank, massive sinkhole, intense heat wave, and devastated growing season. The issue of hazard further incorporates the way a society perceives the danger or dangers, either environmental and/or technological, that they face and allows the danger to enter their calculation of risk" (Hoffman and Oliver-Smith 2002: 4). With advancing shifts, of course, a people may not at all be able to perceive their looming imperilment.

It is important to note that disasters come about in two ways, both of which can be propelled by climate change. Sometimes disasters strike with the sudden impact, as with a violent storm or flash flood. These are called rapid-onset disasters. At other times calamities accumulate over long spans, as with spreading sand or incremental heat accretion. These are called "slow-onset" disasters. Climate change in and by itself is considered a "slow-onset" disaster (Fiske et al. 2014; Fiske and Marino 2020). Nonetheless, it will bring about calamities both unanticipated and abrupt as well as those inching almost imperceptibly forward.

With the disaster definitions in mind, the next matter to elucidate is that humans, in fact, do not dwell in just one environment. They dwell in four, and each must be addressed to understand the interplay of climate and calamity (Hoffman 2017: 194–95). The first environment is the basal terrain in which a people dwell, what is usually referred to by the term "environment," although it might be better termed the "physical plane." The second is a people's "modified" environment. Humans almost never live in a place without altering it. Rather, they sculpt their surroundings. They terrace hillsides, channel streams, lop off mountain tops, and purloin seabeds. In addition, humans erect a third environment, a built one. Upon their physical plane, humans raise houses and temples, pave roads, implant pylons, string bridges, and erect power plants. Their communities spread up and out, all the while superimposing a contrived milieu in which the inhabitants live, eat, sleep, and work. People also reside in a fourth environment, their culture. It is culture that in fact instructs the design and interactions of the other three environments. It proscribes how the physical plane is utilized, the territory modified, what is built upon it, and then how people live (Hoffman 2017: 194–95).

The bottom line is that all four environments are intricately interconnected. A change in one brings about changes in the other. Though environment does not necessarily determine the others, nonetheless, a permutation in the first level, that of the physical plane, generally means an

adjustment to the other three: the modifications, built structures, and, in turn, the governing culture. Still, quite frequently, it is the alterations humans have made to their physical plane that exacerbate climate change and bring about full-scale disaster. In southern Louisiana, for example, while it is true that the Mississippi Delta is subsiding into the Gulf of Mexico, it is the shipping channels that the petrochemical industry has gouged out to allow their tankers ready access that have engendered inundation, salinization, and land loss. It is the excessive use of water to irrigate unsuitable crops, such as rice in arid California or pinto beans in sere New Mexico, that has depleted water tables and compounded desertification. The character of the built environment in changing conditions can also create calamity. Deteriorating buildings increase risk of catastrophic failure, and the spread of chemical and other ancillary pollutants back to the physical plane create health and safety risks for occupants (Burton 2012). Simple placement of the built environment intertwines with threatened coasts, such as with the Daiichi Fukushima nuclear facility. A six-story residential building fell in heavy rains in Nairobi, Kenya. The heavy skyscrapers on the southern tip of Manhattan Island in New York already need continuous water pumping due to rising levels of surrounding water. They were already notably affected by wave overflow from Hurricane Sandy, and yet now the area features towering new residential complexes that are occupied not just during office hours but both day and night. Weighty Mexico City is sinking into its foundational swamp.

The overarching cultural environment of a people can also facilitate turning climate change into calamity, particularly, but not limited to, a culture's economic system. A change of physical plane almost inevitably means a loss or readjustment of subsistence, that is, a people's economic base and their potential famine or resettlement. A society's trade systems combined with climate change can also cause calamity. Due to broadening warm zones, inadvertent transportation of various insects has caused the economically destructive diffusion of deleterious structive beetles to North American forests and abandoned communities (Casey and Whittle 2017). The spread of the fetus-threatening Zika virus has alarmed the populations of the Caribbean and South America. Other aspects of a society's traditions can augment the perils of climate change as well. For one, the customs of some cultures are more facile in adapting to changing conditions, while others are intractable and leave their members in more precarious positions as situations mutate. Some cultures engender in their inhabitants a deep sense of place attachment, making it difficult for them to revamp. Perhaps they have revered systems of land tenure and inheritance or sacred territories, or perhaps the land is inhabited by venerated spirits. After the Southeast Asian tsunami, in Ache, Sumatra,

people planted stakes atop piles of debris to mark out exactly their once extant gardens. Among other communities, kinship is relatively inconsequential, as is abiding ownership. In some, members adhere to the decisions of leaders, flexible or inflexible, no matter what looms. In still others, individual members are free to do and act as they please, including leave. Some people are schooled to heed warnings from outsiders, others to dismiss. Some cultures display wide consensus among the members. Others cultivate contentiousness. Some see themselves as all similar. Others value individuality. In anthropology, we frequently deal with communities that embody constant participation among members, daily meetings, collective discussions. Among them, agreement and action in order to avert calamity willingly emerges. Within other cultural spheres, especially large-states societies, community is, in reality, a pseudo concept. Perhaps for particular purposes, people strive to embrace a "sense" of community. Community is rather like potential and kinetic energy in physics. It may be triggered by the advent of a dire occurrence, but maybe not, and if activated it is not necessarily universal. Behind such cultural difference lies success or failure when faced with climate change.

Two Examples: One Sudden and Unforeseen; One Slow, Recognized, and Relentless

I offer two examples showing the link between climate change and disaster. One appears as perhaps a rather minor case, but it represents the sort of small, localized, yet highly destructive event that will come to pass worldwide more and more in the future. The other tells of a place where climate change, albeit considerably augmented by human complicity, has already wrought so much damage that the people of the region must leave and resettle elsewhere. Both cases come from the seemingly impervious United States where, despite the warnings of scientists, significant climate change denial continues to prevail.

The Boulder Floods: A Perilous Cocktail of Blissful Denial and Climate Change

Boulder, Colorado, is a town of about two hundred thousand inhabitants sitting at the base of the Rocky Mountains about forty miles from the state capital of Denver. Surrounding the town are a number of smaller communities, most historic in origin, but which in recent years have snowballed with new development, adding greatly to the region's increasingly dense population. Boulder also houses the main campus of the University of

Colorado, which welcomes a yearly student enrollment of around thirty thousand. Due in part to the university, the town is demographically relatively young and quite youthful in its orientation. The inhabitants are by and large environmentally aware and politically progressive. Refillable water bottles bounce on backpacks, an almost universal add-on appendage. Many people ride bicycles rather than drive cars, for which the community features a labyrinth of accommodating bike paths. The city also contains a number of America's most significant climate and atmospheric study centers, including the National Oceanic and Atmospheric Administration (NOAA), the National Center for Atmospheric Research (NCAR), and the National Hazard Center, along with major wind, wave, and other renewable energy research centers. Colorado itself offers a relatively stable environment. The state is devoid of volcanos and earthquakes, and while at times it is quite windy, it rarely has but small tornados, and those are relatively recent phenomena. It is speculated that they are the result of changing continental climate conditions. The state does brave flash floods, sizable blizzards, avalanches of both snow and soil, occasional golf-ball-size hailstorms, significant forest fires, and appreciable aridity and drought.

Nonetheless, although the people of Boulder have largely been quite environmentally mindful, even to the point of acknowledging climate change, until recently they seemed to indulge the common notion that the effects of climate change were geographically distant from them, most likely on the seacoast or in arid deserts to the south, but not close at hand. They did not anticipate what climate change could bring upon them or how disruptive those effects could be.

The first full weekend of September 2013, however, was unusually hot in Boulder. The temperature tied a record of ninety-three degrees Fahrenheit (thirty-four Celsius) for September 8, which fell on a Sunday that year. People were still wearing flip-flops, but then Boulderites do that in the snow. There was talk of a cold front coming in, maybe bringing much-needed rain on Monday, September 9. Climatologists had noticed an unusual amount of moisture in the atmosphere and, indeed, on Monday it began to rain quite hard. Experts were overjoyed. There had been a major drought for months preceding the storm, and most were hoping that the yearly rain level would now rise to the norm. Still, the National Weather Service issued the first flash flood warning on Monday for an area in the mountains behind Boulder left bare from the previous year's forest fires. But at this point no one noticed anything unusual, and no one in town was notified.

The rain continued all Tuesday. By Wednesday, the ground saturation level had been reached due to the amount of rainfall, meaning the foun-

dational soil of the town could absorb no more water. Covertly, upslope conditions were beginning to form, a situation where considerable precipitation occurs despite a lack of moisture in the troposphere, a condition not uncommon in the area in winter but not fall. Upslope conditions are usually marked by cold rain, though residents found the rain oddly warm. Meanwhile, flanking the active Colorado storm was a low-pressure system seated over the neighboring state of Utah to the west. In short, a perfect tempest was building, but the pieces were not linked and the potential not recognized "ahead of time," as the Weather Service later disclaimed.

By late Wednesday, some hiking trails were closed due to mud. The town of Erie, slightly east of Boulder, suddenly had standing water and popping manhole covers. Power lines began to fall in the nearby community of Longmont and along the St. Vrain Creek located to the north of Boulder. Cars were getting stuck. In Boulder itself, streets began to flood. The road up Boulder Canyon into the mountains was almost unpassable. The fact that an event was occurring reached the inkling stage. The University of Colorado advised students to get to higher ground, but police and maintenance providers felt they could manage the situation. Officials began sandbagging overflowing creeks, and everyone thought it would be over by Thursday.

On Thursday, nine inches of rain fell, and three more on Friday. Already by the end of Thursday, buildings were being ripped from foundations. Boulder Creek, which flows through the middle of the town, was, by 1:13 A.M., roaring at a rate of 3,104 cubic feet per second. Homes across the area were taking water in their basements and up to the main floor. The town of Lyons and neighboring Hygiene—yes, I think the name is ironic, too—became inundated islands and remained so for months. Without warning, people were forced to desert their homes. Hundreds had to be airlifted out by helicopter. Most of Boulder's streets had become rivers.

The rain continued three more days, for a total of eight. Altogether, seventeen inches of rain fell, almost the full year's average of twenty. Dozens of roads were washed out, dragging cars along with them. Dry ditches became rivers, most running for many months after. Countless boulders careened down old creek beds. Debris slammed against bridges and washed them away. In the end, water spread over two hundred miles. Boulder County was the worst hit. At least eight deaths were reported, with two persons missing and presumed dead and, at first, hundreds unaccounted for. More than eleven thousand homes were evacuated. The towns of Lyons and Erie were cut off from all forms of ground transportation for a number of months. Several earthen dams along the front range of the mountains burst or were overtopped—mind you, earthen dams were still being used here despite the lesson learned from the 1889 Johnstown flood

in the hills of Pennsylvania. Nearly nineteen thousand homes were damaged and over fifteen hundred destroyed. At least thirty state highway bridges were demolished and an additional twenty seriously impaired, with repairs for bridges and roads predicted to cost many millions of dollars. Miles of freight and passenger rail lines were washed out or submerged, including a section servicing Amtrak's iconic California Zephyr (*Boulder Daily Camera* 2013).

But beyond the simple description, there was more to the flood's story. The Rocky Mountains, which form the backdrop to Boulder and the surrounding towns, including the hard-hit Lyons, are not like most mountain ranges. Rather than featuring a series of increasingly rolling and rising foothills building to the highest peaks, the Rockies instead rise abruptly and sharply, much like a massive three-thousand-mile wall. In fact, some of Colorado's highest peaks, called the "Fourteeners," lie in the stretch called "the Front Range," towering directly behind Boulder and within a half-hour's drive of the city. The slopes down from these high peaks, including the very first hills that jut up immediately behind Boulder, bearing the names "Hogback" and "Flatirons," are very steep. Boulder abuts these acute inclines. They are the result of what geologists call the Fountain Formation, a quite young uplift at only about 290,000 years old, comprised of sandstone and gneiss that was formed from the erosion of the mountains laying behind—if that in itself was not a clue. Erosion, dry and water driven, is ever ongoing. As we natives say, for I am a third-generation Coloradan, "The job of mountains is to come down."

I have titled this case study "A Perilous Cocktail of Blissful Denial and Climate Change" because part of the explanation of what became a considerable disaster lies in social causes and the massive denial that led to the event. The area from Denver to Fort Collins, including Boulder, El Dorado, Lyons, Longmont, and Loveland, once an old, sparsely populated cattle ranch and gold-mining region, has experienced extremely fast population growth. There are very few people with any generational history in the area. I am a rarity. My grandfather had shooting matches with Buffalo Bill, but few believe my family has lived in Colorado that long. It is unusual. At best many of the current inhabitants are the firstborn generation of parents who moved to the area. Many are completely new arrivals. Virtual legions of people in the last few years found the district, its geography, its offerings, its climate (not too hot and not too cold), and its lifestyle attractive.

Boulder itself was a sleepy college town when I was a child. Today it has grown from slightly less than twenty thousand in 1950 to over one hundred thousand in 2010. From 1950 through 1970, it doubled every decade. It then grew by a mere ten thousand over each ten-year span, only just recently slowing from that pace. The area is also renowned for attract-

ing what could be termed a "nature-loving," "quasi-hippy" population in search of an alternative or free lifestyle, and believing they are "natural." Most are also definitely "outdoorsy" if not avidly sports minded. Snowboards outnumber persons. People like to ski, climb, raft, hike, and of course bike, even on snow-navigating "fat wheelers" in the winter.

But loving nature, and loving to cavort within it, is far different from understanding it. Few of the many newcomers, despite love of the wild and a desire to exploit its advantages, have endeavored in any depth to understand the environment. Almost none grew up, as I did, with the firm knowledge that mountains, albeit beautiful, are also inherently dangerous. They are powerful, quixotic, and indifferent. They take no heed of the humans traipsing upon them, digging them out for ore or housing developments, or slicing roads through them. Mountains are actually not a toy to be played with, but that has not been the cultural attitude of the new inhabitants. Even in the old days, the first pioneers who only exploited the hills to derive a living, did so with trepidation. Practically no one who lives in Boulder today even knows the history of the name of the town. Well before Colorado became a state in 1876, Boulder was named for the number of boulders that had washed down from the hills and lay strewn about below. That small bit of information might have given yet another hint to what has been happening for eons.

There further exists an extensive history of major floods in Boulder and the surrounding towns, all the way from Denver north to Wyoming. Yet, the current population blithely lacks almost all knowledge of the flood danger and the deadly chronicle of floods, even though numerous written reports exist and old, black-and-white photographs as far back as the old gold-mining days of Boulder and nearby towns buried in flood-deposited mud can be seen hanging on the walls of many of the town's cafés and saloons. In short, even if no one read the stories of past floods, visual clues abounded. Yet, the prevailing attitude in Boulder and in much of Colorado—climate change notwithstanding—continues to elide the history and comprehension of their environment.

As a community, Boulder and the cluster of towns nearby have, indeed, germinated a rather distinct "culture." Not unlike Berkeley, California, it is referred to in jest as "the people's republic of Boulder." More than just having the liberal politics of Berkeley, Boulder has a strong concept of being "at one with nature." I do not mean this pejoratively, as I adhere to much the same feeling, but Boulder is extreme. Gluten dare not enter. Plastic bags can cause an outburst of hysteria, and most would shudder to learn—talk about blinders—that Colorado actually grows sugar, lots of it, and nearby. The geography is treated almost exclusively like a "mother," as I have written, and not a "monster" (Hoffman 2001), though the entire

region is virtually crosshatched—veined is the more technical term—with ditches, from tiny, very narrow troughs to wider cracks that we in the west would call "arroyos," to trenches four feet or more wide and deep and lined with rocks. Few among the population, as the habitation has expanded, have apparently questioned how those gullies were formed, as almost all of them appear dry at least most the time, if not always. Nor has the query been broached on how the numerous rocks got in those ditches. Few, furthermore, have ventured to realize that the ridge lying just to the south of Boulder, allowing for a lovely overview of the whole Boulder basin, is actually not hill but a lateral glacial moraine full of dirt and stone detritus, nor do they appreciate that Boulder owns its own glacier, relentlessly melting and moving down the mountain that was for decades the town's main source of water. Glaciers leave behind numerous runoff streams and ditches that carry lots of rubble. Also, the Rockies are arid and unable to hold much moisture. Even the shortest downpours, like the two-hour summer afternoon monsoons that Boulderites thought the September rain was, albeit late, rapidly cause streams to fill and transport considerable debris, such that washouts of roads and streets are common.

There are additional sociocultural factors, but the ones I have already mentioned alone created a serious lack of risk perception leading to the storm. On top of them, the region's growth brought with it a tremendous spread of building probably not fit for the territory, as the fires of the previous year had already demonstrated. Along with far too much urban-forest interface, and, indeed, with some acknowledgment of flood zones, over time developers neglected to take heed of the potential hazard inherent in the ditches and general geological history. Since most of the seemingly inactive trenches had remained dry for years, many were assumed to be of no consequence and were plowed over to make way for highways, parks, apartments, and houses. As a result, a large number of parks, roadways, highway on-ramps, and basements in the town became bathtubs. Hence, expanded denial, increased population, lack of knowledge, naive development, and building for "probability not possibility," as the storm revealed, caused a major surge in vulnerability.

Still, there was another factor involved in the calamity, one quite high, stealthily covert, and very much derived from climate change: global warming. It has long been predicted that, as an aspect of climate change, storms would increase in frequency and power. Already mentioned was that this storm came well after the season for summer monsoons and well before the onset of winter storms. It also involved ingredients common to both yet rarely mixed, upslope conditions, an odd mix of moisture and dryness, and pressure systems, with very hot weather preceding. In addition, and very contributory, before the storm the area experienced a long

and serious drought—evidence, long predicted, that the region is and will see increasing aridity.

What these conditions caused is something not often mentioned yet pertinent to ongoing climate change: increased contrast between drought and flood. The whole Denver-Boulder area is becoming hotter and dryer than it was when I was a child, but more importantly, the switch between hot and cold, dry and wet, drought and rain, is no longer a continuum but now a dialectic. Not just true for the state of Colorado but also worldwide, it is one the Earth will have trouble handling, as each extreme entails vastly differing conditions that will implicate more human communities. The Boulder area, as an example, will as a consequence experience more weather systems going upslope, not downslope, and in several variations, not just the mix of winter upslope combined with summer downslope. As well, hot dry air will sit below systems as they move upslope, causing storms to recycle upon themselves much like the single twist of a tornado, heading in an up-down direction instead of a lateral one.

In following, with the advent of such increasing storms, and not yet much discussed in general, is the phenomena called "hovering." Due to climate change and global warming, storms will linger at length and not move readily on, escalating the amount of rain, snow, hail, wind, or whatever destruction they involve and concomitantly impeding the ability of victims to sustain through them. This is partly due to a practice that is not generally done, which is looking high up enough. By and large, climate change studies have focused on changes occurring on the ground or in the near atmosphere, but warming is also affecting something much more elevated some two hundred miles up: the jet stream, and it decidedly added to the Boulder floods.

After crossing the Arctic, the jet stream enters the North American continent around the United States Pacific Northwest, in Washington and Oregon. It then moves east over the Rocky Mountains, makes a sharp turn, and travels down the Rockies to the south, along the eastern edge of the mountains through much of Colorado, up until just about Colorado's border with northern New Mexico. There the jet stream turns east again and moves across the continent to the Atlantic. Due to warming in the Arctic, the jet stream is picking up more moisture than it previously held, and with more moisture in its currents, it is moving slower. Thus, the storms that occur along it do not move as before; rather, they dawdle, or "hover."

Of course, a storm such as the one that brought about the Boulder disaster does not just end when the rain finally ceases. Like a comet, such storms, and the climate change they actualize, have a tail. Due to the damage left behind by Boulder's exceptional storm—the loosened banks, the loss of rock siding, the wider and deeper ditches and creeks—weather

experts around Boulder predicted much higher snowmelt and runoff the following winter and, consequently with it, persisting havoc in Boulder and its surroundings. The annual runoff usually begins in May as the air warms up, but the temperature in Boulder already by March was in the seventies Fahrenheit (twenties Celsius). Experts also forecast far more devastating summer "monsoons" the following year. Mountain monsoons are often intense afternoon downpours that last up to several hours in July and August. They are both preceded and followed by the annual destructive fires from summer to autumn, and all of these occurrences were forecast to come not for Boulder not just the year following the flood, but onward.

What is highly disturbing to me is how the Boulder flood became referred to as the "thousand-year flood," or, following protests, the "thousand-year rain." It is declared such in the titles of books about the flood (Prairie Mountain Publishing 2013), in talks and media presentations, and in newspapers, internet sites, and blogs. The population of the region has also adopted the term. Thus named, the people who underwent the disaster have latently assumed in their collective thinking, that a similar storm will not occur in their lifetimes. The very name instills cyclical thinking beneath the America's overt linear view of time. It suggests that a similar tempest will not happen again for another thousand years, as if Boulder operated on a Buddhist time wheel and not a Western progression. But then maybe Boulderites simply operate in this way, along with the younger generation all over the country. A significant number seem to be manifesting a cultural change in America toward viewing themselves as more "natural" and spiritual and the world as more mystical and rhythmic despite their reliance on ubiquitous digital devices. Numerous Tibetan monks reside in Boulder. There exists a Buddhist university in the center of town, and prayer flags flutter on myriad porches. Why not a Buddhist, or Hindu, or Mayan rotating calendar? Of course, climatologists realize that the term means a one-in-a-thousand chance of occurrence again within a certain time span, but the general population does not think that way. They think it indicates a literal thousand years. However, even a one-in-a-thousand chance does not imply that such a storm will not occur again next year, or the year after, or every year, especially with climate change driving the elements.

Isle de Jean Charles: A Story of Advancing Inundation and Dislodgement

The Isle de Jean Charles band of Biloxi-Chitimacha-Choctaw Native Americans was a late-arriving group to the narrow strip of low, fertile land south of the Chickasaw River in the Mississippi Delta of Southern Louisiana when they drifted in around 1832. The place had once before harbored

human habitation, probably by the early Hopewell Mound Builders. They had long since disappeared. Those arriving now spoke a Muskogean language and were related to the Iroquois. After first being displaced from their original homeland in Florida and Alabama by French settlers in the 1700s, the people now sought an even more remote sanctuary in the Mississippi Delta in order to escape the Indian Removal Act, also known as "The Trail of Tears." Of the many Native American groups who made up the Muskogean speakers in their original homeland throughout the American southeast, the members of Biloxi-Chitimacha-Choctaw branches were the most renowned agriculturalists. They were also the most democratic, peaceful, well-organized, and least formal in their politic. The new strip of island land this particular group now fled to was considered uninhabitable swampland by white settlers. Yet it was plentiful in vegetation, nurturing estuaries, and wildlife. Once taking roost, all the members held the land communally as they had in their previous home, with individual families responsible for specific fields. Men worked the land, trapped, gathered oysters, and fished, an activity that provided much of the tribe's diet. Women hoed and cooked. Everyone harvested. Afternoons were devoted to collective games and entertainments. Life was bountiful. The group also traded extensively along trade routes extending as far away as Algonquin territory far to the north along the Mississippi River (Underhill 1953). Their life was engrained, their place deep-seated.

Early on, the band had fallen under the geographic and political influence of the French, as had all of Louisiana. One legend states that the island they occupy, which today sits in Louisiana's Terrebonne ("beautiful land") Parish, got its name from a Frenchman named Jean Charles who married one of their native women. The band also adopted the French language, which they continue to speak today. They had started out predominately Choctaw. Over time, the germinal Choctaw incorporated members of the more isolated neighboring Biloxi, the Louisiana Chitimach, and finally people of Acolapissa and Atakapa heritage. Throughout their union forward, the entire blended group lived a highly interactive and kinetic form of community life. While the residents of Boulder, Colorado, share more of a perception of collective culture than reality, the Isle de Jean Charles band, on the other hand, has always vigorously engaged in ongoing interaction and fellowship, partaking in customs, ceremonies, and daily interchange. Included in their traditions has been espousing a single inherited chief who acts as spokesman and arbiter for the whole collective. That custom has continued until today and has allowed them to stay cohesive (www.isledejeancharles.com).

Originally the Isle de Jean Charles land holding consisted of 22,000 acres. It now stands at a mere 320. The land began disappearing due to

rising seawater, coastal erosion, and flooding starting in about the 1960s, conveying with it what Nixon has called the "slow violence of climate change" (2011). As is very often the case, however, the devastation of climate change has been greatly augmented by human enterprise. In the Jean Charles case, the initial island has been seriously fouled by three heedless practices: major oil extraction by the petrochemical industry; the gouging of numerous shipping channels to accommodate the oil industry, which has allowed massive water inundation and salinization of the soil; and the construction of dams, dikes, levees, and other flood-control measures by the US Army Corps of Engineers to protect industry and private holdings in ways detrimental to the Isle de Jean Charles people, proving a favorite saying of mine that "one person's protective levee is another person's flood."

In addition, the privatization of land, with its consequent uncontrolled use, allowed for soil-destabilizing logging. Unfortunately, the Isle de Jean Charles territory has always been considered federal property over which the tribe had no control. The Isle de Jean Charles are recognized as a Native American group by the state of Louisiana but not by the United States federal government. The tribe has never had a federal treaty, no deeded reservation, and, thus, no authority over their home; thus logging permits were granted over their territory. Now more than 98 percent of the land has been lost, and, as a result, over 75 percent of the tribe has been dislodged and displaced to nearby towns, cities, and regions farther afield. By 2009, only twenty-five houses remained, down from sixty-three in 2004. The land sank away so rapidly that by 2016 only one substantial garden remained (Maldonado 2014a; Jessee 2016). Beyond advancing climate change flooding, the oil and gas extractions have caused another sort of disaster: severe health issues on an epidemic level (Laska et al. 2005).

There occurred, however, a turning point, which even more vastly accelerated the land loss and disaster. It stemmed from the massive flooding that followed the series of brutal hurricanes that struck Louisiana between 2005 and 2008, all doubtless climate exaggerated. In particular, the island and people suffered acutely from Hurricane Katrina (2005), which savagely glutted the already disappearing dirt. That devastation was then exacerbated by Hurricane Gustav (2008). More recently, in 2016, a multiday torrent arrived from a low-pressure system combined with record amounts of atmospheric water vapor, resulting in two feet of rainfall over the area within three days. In short, the destructive climate change factor for the Isle de Jean Charles occurred from downward atmospheric circumstances as opposed to the upward ones (e.g., the jet stream in the Boulder case), both rather furtive expressions of climate change. The increased atmospheric warming, largely human induced, caused water vapor to

increase very near to the land mass, and from it came an unabsorbable, heavy barrage (Mooney 2016). With the salt, the channels, the hurricanes, the climate, and human interference, the Isle de Jean Charles territory, its archaeology, and its history, floundered. Meanwhile, the US government and state of Louisiana, in order to protect the delta and coastal lands from the accumulating erosion ensuing from such events, formed a commission, the Coastal Protection and Restoration Authority, covering much of the endangered territory, but the Isle de Jean Charles lay outside the border of the proposed levee system and was not within its indemnity.

The tribe, with little choice, decided to move. Indeed, they are being called "America's First Climate Refugees," an epithet the tribe resents. As opposed to the naivety of the Boulder, Colorado, citizenry, the Isle de Jean Charles band has long been acutely away of their deteriorating situations and at first adapted indigenous ways to deal with it. Prior to their exclusion in the hurricane protection system, the tribal council had favored accommodating to the changes through restoration of wetlands to stem or reverse erosion and allow them to stay. For example, their original houses were constructed of a mixture of mud and moss with a domed roof covering of palmetto and floors of clay. But recognizing that these dwellings were not flood resistant, the people soon reinvented their built environment to elevated clapboard structures. All along they have shown keen assessment of their physical plane and its character, even as it changed, along with the flexibility to adapt and not just cope. But the exodus of people spurred by the exclusion from the hurricane protection system and the hurricanes themselves proved a pivot point (Maldonado 2014a and 2014b; Maldonado 2019).

Today, and for some years now, as they have noted the seemingly unstoppable loss of their environment, the band has astutely begun to plan their own relocation independently of governing bodies, county, state, and beyond. Their decision to relocate as climate change crept up did not happen instantaneously but developed over time, as houses tilted and then sunk and the fields that sustained them became silted and water-saturated troughs. The number of people gradually dwindled to a small remaining core (Maldonado et al. 2015; Maldonado 2019). Noting the plight, in 2007 the Gulf Coast Comprehensive Restoration Plan offered the tribal members relocation on an individual basis, that is, the plan proposed to buy homes one by one in order that individuals might relocate as they wished. The tribal council countered with the position that, as was their long-standing tradition, they intended to remain together and relocate as a whole. They further resolved to relocate in a fashion that would bring those already dispersed back into the fold. Maldonado and Peterson (2018) call the path taken by tribal leaders and the community members

"community-led resettlement." It is a tenet that needs recognition and implementation worldwide in the face of climate change. Community is more than just houses; it is the people, their interface, their kinship, their familiarity, their knowledge.

Heritage communities nationwide and worldwide, like the Isle de Jean Charles band, are searching for support in the forced migration they face due to the disasters climate change is instigating. All are having to so on an ad hoc basis, as there is no body of dedicated laws or programs to which they can turn. The entire-group approach has so far struck governing bodies as far too unwieldy and expensive It often demands unachievable alliances between government and nongovernment agencies and allies. It further bears substantial up-front costs. Land must be obtained, and not merely in terms of singular plots but rather major holdings large enough for many. Homes and facilities need to be constructed. Confronted with these sorts of obstacles, obscuring what is perhaps the truth tantamount to denial, administrating bodies bury their heads in literal rain-drenched or desert-seared sand.

The Isle de Jean Charles band appealed beyond the state to both the US Congress and the United Nations. They have now received a significant grant, a $48 million allocation of US federal tax funds to move the entire community. The grant is a first in enacting climate change relocation. It is being called a "climate resilience" grant. It differs from prior funding in that most of the money the United States has so far provided for climate change issues has been for infrastructure, not human matters (Davenport and Roberson 2016). Still, the "where," "when," and "how" of the Isle de Jean Charles band's move is yet to be determined. The people only know that the next flood will finalize their total exile, so a plan must soon be devised and carried out. The intent is to save as much of their culture as they can, together. Maldonado (2019) calls the objective "cultural triage." As they work toward a proactive community-led resettlement, they hope to provide an exemplary model for other communities who need to choose a new site to sustain their entire communities, to bring back together people who have already been forced apart, and to maintain their family bloodline social connections, lifeways, integrity, and sovereignty (Maldonado and Peterson 2018).

Conclusion

While climate change has great impact for the Earth, its land, seas, and air, my ultimate focus in studying the impact of climate change and its undeniable link to disasters is on the continuity and diversity of human

existence and the ability of people to thrive, if not their original their habitats, then in ones in which they can continue holistically as a group with their culture and lifeways.

By and large, climate scientists have focused on the globe's various ecological zones and what is happening to soil, vegetation, water systems, and weather systems. In fact, it is not just one culture that is truly at issue in the matter of climate change and its consequent calamities, it is all of them. To date, while the focus has been largely on the most vulnerable populations, the disenfranchised, poor, and marginal, as the upscale Boulder example shows, the impact of the devastating union of climate and catastrophe is on all people everywhere. The capacity to surmount disasters or adapt to them, to contend with fluctuating or grievous circumstance and prevail, amounts to peril for everyone. Indeed, numerous experts see the matter of whether human lifeways can alter in relation to critical climate phenomena as indicating whether the species retains enough flexibility to adjust and keep thriving or by inattention and not changing, "dig its own grave."

The matter of global warming and its impact on accelerating disasters unquestionably set a critical stage, bringing out existential concerns, action, and arenas of discourse within a society, local and beyond. The hope, as Bergman (2020) points out, is that the intermesh of the two becomes a great motivator of social action, for social action motivates change. People do not sink into inertia when faced with calamitous situations, they react. They throw into stark light not just inequalities but conflicts and struggles over power and over cultural differences within the entire human realm—in a nutshell, the whole spectrum of social matters as well as physical ones. They raise questions of a metaphysical nature as well. All in all, climate-caused disasters present extraordinary examples of the fluid quality of culture, the invention and reinvention of cultural goods, and the areas of harmony, disjuncture, inconsistency, and coherence (Hoffman 2016, 2002). Furthering the matter, we live today in an era of expanding globalization; progressive corporate, state, and international hegemony; the exploitation of resources; and the continuation of global warming, which causes the loss of land and water, resettlement of groups, and demographic and behavioral shifts that force humans to occupy less safe habitats and embrace more perilous technology (Hoffman 2016, 2002)

Stopping and correcting climate change is certainly needed, but along with it, in order to prevent attendant disasters, the other great necessity is to reduce risk everywhere, that is, to end vulnerability. There are numerous ways to expedite human adaptation to the Earth's changing circumstances, to increase capacity, augment flexibility, and heighten safety, including of people's subsistence, social structure, cosmology, cultural sustainability, and potential resettlement as many of the preceding chap-

ters in this volume show. There are ways to advance agency and place-based programs. We cannot change some of the kinds of disasters, but those caused or enhanced by climate change, we can deter. I further posit that the anthropology perspective and approach can help to integrate the human and natural systems. Stopping the global processes that are creating increased vulnerability is like, according to Zygmunt Bauman, trying to prevent weather change itself (2000: 33), but there are ways around the weather. Barnes et al. (2013) emphasize the increasingly critical role of anthropological contributions to discussions on climate change by including not only physical descriptions of the phenomena occurring but also bringing in questions of different cultural groups' receptivity to climate policies, that is, the whole conundrum of what the effects might be on lives and the viability of lifeways. In agreement, Button (2010: 248) contends that we must change the public discourse on what is acceptable to say about disaster, a discourse that so far usually tries to maintain an emphasis on scientific and technical aspects while avoiding other realms, such as values, ethics, policy, and politics of laypeople. That goes for climate change as well. Along this line, Crate (2011) agues for a climate ethnography that is multi-sited, collective, and inclusive of all those concerned in order to trace global processes locally and track how they are being articulated via local knowledge systems. Only such an ethnography will elucidate the convergences and conflicts between the global-to-local conversations and understandings about climate change. Cox and Cox (2016: 324) argue for a correction of the neoliberal and developmental policies, which they call the disciples of creative destruction, that impel both climate change and disaster.

David McDermott Hughes, in his article on climate change in *American Anthropologist* (2013), uses the term "innocence." He means it to refer to ignorance of geography and what climate change is bringing, but he also gives a nod to its meaning in morality. He talks of activists and social justice. Considering the clear and ever-present link of climate change to disasters, present and looming, often appallingly severe, I also see the issue as close to something akin to the criminal charge of "reckless endangerment." It leads not just to damage but also to death. Treating nature as a market or a plaything without understanding the real "nature" of nature; remaining ignorant of geography, weather, and past events; and being guileless about climate change are actions that make for an innocence the world cannot afford.

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Angry Earth (second edition, 2020), *Catastrophe and Culture: The Anthropology of Disaster* (2002), and *Disaster upon Disaster: Exploring the Gap Between Knowledge, Policy, and Practice* (2020); two ethnographic films, including *Kypseli: Women and Men Apart: A Divided Reality* (1976); and more than forty articles and chapters. She initiated the Risk and Disaster Thematic Interest Group for the Society for Applied Anthropology and is the founder and chair of the Risk and Disaster Commission for the International Union of Anthropology and Ethnographic Sciences. She was the first recipient of the Fulbright Foundation's Aegean Initiative dealing with the Greek and Turkish earthquakes and helped write the UN Statement on Women and Disasters. She is a frequent national and international speaker and also serves on the Task Force on World Food Problems.

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