

CHAPTER 14

Psychological Impacts of Climate Change and Recommendations



Lise Van Susteren and Wael K. Al-Delaimy

Summary Although the harm to our physical health from the climate crisis is increasingly reported, still underrecognized is the harm the climate crisis is having on us *psychologically*. Yet it is the psychological impacts of *global overheating*—and the consequent cascading destabilization of ecosystems—that will carry the biggest burden and be the most difficult to remedy. It requires our utmost attention. Understanding the gravity of the mounting psychological harm underscores the urgent need for all those concerned, especially public officials, to take action. The devastating psychological and physical impacts of the tragedy of lead-tainted water in Flint, Michigan, in microcosm, serves as a recent example to those who would downplay harm to our health in the face of ongoing warnings and pleas for action. The psychological aspects of the climate crisis are increasingly drawing the attention of mental health professionals. They are uniquely qualified and urgently needed to address the denial, discounting, or distancing that feed inaction, and to point out the deepening injustice of putting vulnerable populations at risk, especially our children and future generations. They are also needed to advocate for programs that address climate anxiety and trauma, and to design programs that build resilience. The mounting risk of an epidemic of fear, outrage and despair calls for mental health professionals to play a pivotal role in what has become a do-or-die effort to restore humanity and the rest of the natural world to safety. All of the losses associated with climate change—from extreme weather events and chronic climate conditions to the devastating physical injuries, illnesses, and deaths and the attendant displacement, disruptions and downstream indirect ripple effects—carry with them an emotional toll. The magnitude and relentlessness of the destruction, as well as the insinuation into every aspect of our lives—economic, personal, political—must be recognized as we consider the mental health and psychosocial impacts of the deepening crisis.

L. Van Susteren (✉)
Physicians for Social Responsibility, Washington, DC, USA

W. K. Al-Delaimy
University of California San Diego, La Jolla, CA, USA

Extreme Weather Events

The global rise in temperature is driving local spikes of searing heat waves and increasing the frequency and intensity of storms, wildfires, and floods. In the last two decades, extreme weather has wounded, displaced or required emergency assistance for four billion people; half a million have died (United Nations Office for Disaster Risk Reduction, 2015).

Extreme weather events drive emotional turmoil in every phase. Anticipatory fear is experienced in the early stages, followed by the trauma of the event itself, then sorrow and grief at the losses. Feelings of outrage may emerge—slowing down the working through—when it is believed that government and institutions are not providing enough help or didn't undertake preventive measures. Despair and feelings of helplessness deepen as reports surface that conditions will get worse.

Those in disaster-prone areas are the most affected. Anticipatory anxiety sometimes rises to the level of “pre-traumatic stress disorder” among those who fear that another disaster may be just around the corner. In anecdotal reports, residents of New Orleans report, for example, that sometimes just seeing a storm cloud triggers deep anxiety (Hauser, 2015; Reckdahl, 2017). Communities under stress can fray and decompensate—increasing violence and other psychosocial ills. Mental health professionals are seeing a full range of psychiatric disorders and conditions emerge as a result of these stressors: major depression, anxiety, PTSD, adjustment disorders, a rise in drug and alcohol abuse as people attempt to cope, and domestic violence—including child abuse (American Psychiatric Association [APA], 2017; World Health Organization, 2005). In addition, the more destructive the event, the higher the incidence of PTSD and the greater the risk of suicide (Edwards & Wiseman, 2011).

Processing disaster After a *natural* disaster, an identifiable low point is seen, followed by the feeling that the worst is over, and the recovery process can begin. How we process the event is determined in part by how we answer critical questions: *why* did this happen, *who* or *what* is responsible, and could the disaster have been prevented? Disasters experienced as natural are easier to reconcile because they are experienced as “fate”—beyond our control. When disasters are no longer experienced solely as natural, as “acts of God or nature,” but instead are experienced as having arisen or been made worse because of the behavior of humans—due to a mistake, carelessness, or worse, as *the result of deliberate disregard for consequences*—then it is much harder for us to recover and the psychological harm is more serious (Folkman, Lazarus, Dunkel-Schetter, DeLongis, & Gruen, 1986).

How we “carry on” is influenced by our background, current mental state, personality, and life experiences. The nature of the event plays a role: the intensity of the feeling of powerlessness, the “merciless” character of incidents, the pace, suddenness, degree of damage, loss of life and injury and the extent to which people personalize these incidents will be factors influencing the extent of emotional injury. Though studies quantifying it are limited, human empathy tells us of the emotional toll: When the place you call home is burned down by wildfires, blown away by tornados, flooded or overrun by hurricanes, when you lose your possessions, maybe

your pets, your livelihood, the comfort of a familiar community, and witness the injuries, illnesses, and deaths, the resulting mix of fear, anger, sorrow, and trauma can easily send a person to a breaking point. Stress drives up the secretion of cortisol; high levels of this hormone are not damaging when they are short-lived, but *persistently* elevated levels can be exceedingly damaging. Immune function can be compromised, sleep patterns disturbed, digestion disrupted, memory impaired, and the cardiovascular system harmed—all with an attendant emotional toll (Shaw et al., 2019). Everyday life is full of burdens and anxieties; confronted by the additional stress of the climate crisis, some individuals will decompensate.

Exposed to repeated or ongoing disasters, victims may not have a chance to recover emotionally before the next disaster hits, compounding the harm because each incident deepens emotional vulnerability. Victims also contend often with the realization that “no lessons have been learned”. The healing process is helped along when we can look back, identify where we went wrong and take action to legitimately say we are doing all that we can to prevent further injury. But on the contrary, even as the dangers continue to unspool at an ever-higher rate, the extraction and use of fossil fuels continues, with recent US government policies *promoting* their use—exacerbating the mounting psychological toll.

Wildfires Increasing temperatures from climate change dry out land and vegetation, causing bigger, more frequent and intense wildfires. Homes and communities are increasingly finding themselves in fire-prone areas. While the physical impacts of fires can be measured as lives lost, structures burned, and communities disrupted, the psychological damage is immeasurable. The acute phase is dominated by fear—or *terror*. The mercilessness of flames, incinerating everything in their path, has a particularly devastating effect on those who witness what has happened—and they may be unable to shake loose from intrusive and horrifying thoughts of what it is like to burn to death. When the flames are finally spent or defeated, seeing what was once a comforting refuge but is now nothing or little more than a moonscape brings overwhelming grief.

Various phases of disasters have been studied, along with many common emotional responses to them (SAMHSA Phases of Disaster, 2018). Based on the clinical experience of the first author with victims of trauma, including of natural disasters, many emotional stressors have not yet been measured but warrant being pointed out. In an initial phase, vows to rebuild and faith in outside support do help in the first steps towards emotional recovery, but fears of “next time” often plague survivors. Wrenching, conflicting feelings about remaining in the vulnerable area, financial strain, and friction from different coping styles may erode family stability. Lingering feelings of helplessness, despair, and foreboding make restoring a sense of security more challenging. Emotionally charged triggers can reawaken traumatic memories—in the case of wildfires, by the simple smell of smoke, the sound of sirens, the once-pleasant crackling of an ordinary fire. Acute displacement may become permanent—rupturing the comfort and stabilizing effect of familiar relationships, places, and daily routines. Some scars may be buried or disguised—expressed in ways that make them not only hard to “count” but worse, harder to confront and work through. The stress on individuals and communities is compounded by mental health systems that are underprepared to deal with the trauma.

Violent storms and floods Violent storms and floods are responsible for half the disasters from extreme weather events (UNISDR, 2015). Higher temperatures increase the moisture content in the atmosphere, increasing the severity and frequency of storms. As with other extreme weather events, violent storms and floods unleash catastrophic physical and emotional harm—bringing about the disorders and conditions cited earlier. Of all extreme weather events, flooding affects the greatest number of people. The financially stretched are most vulnerable, with the physical difficulty of getting to safety too great or the cost too high—which the financially privileged may sometimes forget when they ask why people did not get out of harm’s way. Even temporary housing is frequently beyond the reach of those who live paycheck to paycheck.

The far-reaching psychological impacts of violent storms saw their prototype in Hurricane Katrina in 2005, now “updated” by other storms, in particular the devastating Hurricane Maria that leveled Puerto Rico in 2018. Grief, anxiety, violence, outbursts of outrage, and blame at the government’s slow response are among the acute emotional stressors of many victims. Many report feeling that the government “doesn’t care” about them (Morin & Rein, 2005).

A flood-ravaged home brings a particular type of anguish. Based on experience, violently being run out of one’s refuge from the outside world underscores the fear that no place is safe. Seeing belongings a soggy ruin, often turning black and moldy as they undergo the slow but inexorable process of rotting, brings unconscious associations to dying and death. The sense of powerlessness over “nature unleashed” can weigh heavily on victims.

The widespread presence of mold in homes and other buildings is common in the aftermath of floods; the physical symptoms associated with exposure to mold are well documented (Potera, 2007). Exposure to mold is also linked to psychiatric disorders, especially depression, and reduced cognitive functioning (Shenassa, Daskalakis, Liebhaber, Braubach, & Brown, 2007). Other impacts include anxiety, irritability, and fatigue (Hope, 2013). Toxic mold-induced mental illness and cognitive decline are rarely correctly diagnosed or treated.

Research confirms the association between the chronic stress of climate disaster emotional trauma and cardiovascular health (Peters et al., 2014). Residents of New Orleans suffered heart attacks at a rate three times higher than the rate reported before the storm (Peters et al., 2014). The absence of social support when communities are torn apart is one of the strongest predictors of posttraumatic stress (Brewin, Andrews, & Valentine, 2000; Ozer, Best, Lipsey, & Weiss, 2003).

Summer Heat Waves

As global temperatures rise, the incidence of extreme heat waves is increasing. Nearly one-third of the world’s population is now exposed to deadly heat waves (Mora, Counsell, Bielecki, & Louis, 2017). In the last decade, with less than 1% increase in

warming, the loss of human life has risen 2300% (Mora, Counsell, Bielecki, & Louis, 2017). Significant psychological stress is also associated with heat waves. With rising temperatures comes rising rates of aggression (Bulbena, Sperry, & Cunillera, 2006; Raj, 2014). It is linked to increased catecholamine release in response to the stress of the heat (Al-Hadramy & Ali, 1989). For each standard deviation of increased temperature or more extreme rainfall, studies show a 4% increase in conflict between individuals, and a 14% increase in conflict between groups (Hsiang et al., 2013). These findings are valid across all regions and among all ethnic groups. Increased acts of aggression include assaults, murders, and suicides, especially violent suicides. As temperatures continue to rise, a global increase in unrest should be anticipated.

Temperatures *modestly* above the human comfort zone are associated with a decline in cognitive functioning: slowed response time, diminished accuracy, and less sophisticated patterns of decision-making. Declining cognitive function could become increasingly problematic for those unable to escape the heat (Goodman, Hurwitz, Park, & Smith, 2018). The mental health toll from heat waves is hard to measure. Like blizzards and storms, the disruptions of heat waves range from irritating inconveniences to profoundly stressful losses. Declining business and productivity—which drops at high temperatures—are consequences of extreme heat (Somanathan, Somanathan, Sudarshan, & Tewari, 2018). Those who must work outdoors or where AC is not available may not be able to work at all. With little financial cushion, it may not be possible to pay bills or even buy food. The emotional toll on families and the communities they live in can be horrendous. With the persistent high temperatures and the ever-expanding desert that they create, scientists predict that the Middle East may well become uninhabitable by the end of the century (Funkhouser, 2016).

Particularly vulnerable are the poor, the elderly, the sick, and the very young. Individuals with preexisting mental disorders are also especially susceptible. During hotter-than-average periods, they appear to get sicker than expected, show greater aggressiveness towards others, and require more frequent use of restraints (Bulbena et al., 2006). The good judgment to stay cool and hydrated may be compromised; some individuals in this population live outdoors and lack access to air conditioning. Many take medication (psychotropics) that impede the ability to perspire—the body's chief means of reducing internal temperature.

Chronic Climate Conditions

Drought Conditions

Drought conditions are worsening with rising temperatures, particularly in the western United States. Drought has its own attendant, often chronic, mental health impacts (Stanke, Kerac, Prudhomme, Medlock, & Murray, 2013). An unrelenting day-after-day anxiety and despair can descend on those who depend on nature's

rains for their livelihood—farmers, day workers, owners of related businesses—who watch and wait for water that does not come. A serious and protracted decline in available water may force many to make life-altering changes, with stressful impacts on individuals, families and communities (Vins, Bell, Saha, & Hess, 2015).

Suicide is the result of complex dynamics, but prolonged drought is considered (in most studies) a major contributing factor among at-risk populations for suicide among farmers in India, rural Australia, and South Africa (Carleton, 2017; Hanigan, Butlera, Kokicc, & Hutchinson, 2012; Vins et al., 2015). The psychological toll on families who have lost their fathers, sons, uncles and brothers, in addition to what is often their sole source of income, is devastating. Entire countries now compete for water from the once great rivers of the world—the Mekong, Jordan, the Brahmaputra, the Tigris and Euphrates, the Nile—bringing rationing and water wars as tension mounts (Bhalla, 2012). The decline in available water brings food insecurity—unleashing a flood of its own woes—with individual impacts ranging from the personal stress of hunger and rationing to malnutrition, starvation and death when conditions persist. In the crops the world's poor are most dependent on, malnutrition from higher concentrations of atmospheric CO₂ *alone* causes malnutrition from micronutrient deficiencies responsible for cognitive deficits and other physical harms, carrying with them an emotional toll that can be lifelong (Smith & Myers, 2018).

As climate change worsens and causes more droughts, millions will continue to see their access to drinking water threatened. Access to water grips us emotionally in ways other needs do not because we cannot survive beyond a few days without water. When a community has a dwindling supply of clean water—from diminished snowpack, accelerating and pre-season melting of glaciers, drying up of rivers, streams, lakes, and aquifers, or from saltwater intrusion or other climate-induced contamination, a deepening sense of anxiety and foreboding follows.

In regions dependent on agriculture and already rife with ethnic tensions, strained by poverty and political divisiveness, climate related disasters are “threat multipliers” for outbreaks of violence (Schleussner, Donges, Donner, & Schellhuber, 2016). Ongoing periods of water scarcity, spiked by periods of drought, particularly in the growing season of these vulnerable regions, trigger not only spasms of violence but sustained cycles of conflict (Von Uexkull, Croicu, Fjelde, & Buhaug, 2016).

News reports have covered how new waves of migrations created by regional conflicts often drive people to relocate in places that do not want them and cannot help them (Baker, 2015). Those with the fewest resources are often unable to relocate—“trapping them in high risk areas” (Randall, 2013). Although sometimes controversial—and complex to assess, peer-reviewed reports specifically tie the recent scarcity of water in Syria to increased migration and the geopolitical tensions it spawned (Müller, Yoon, Gorelick, Avisse, & Tilmant, 2016).

An influx of refugees can stir fear, uncertainty, and anger—due to pressures that mount from scarce resources, inadequate infrastructure, problems adapting to changing circumstances and cultural differences, limited or absent health and mental health services, along with pervasive and profound physical and psychological trauma among refugees (Langlois, Haines, Tomson, & Ghaffar, 2016). Data from

157 countries demonstrated that drought severity and likelihood of armed conflict played a role in explaining increased asylum seeking between 2011 and 2015 (Abel, Brottrager, Crespo Cuaresma, & Muttarak, 2019).

Confrontations in southwestern and southeastern states over water are leading to legal battles. In California, drought conditions have forced rationing, with news reports that neighbors engage in “drought shaming,” fighting, and tattling on each other over their water use, foreshadowing what may lie ahead (Huffaker, 2015).

Sea Level Rise

Global sea level is likely to increase 10–13 feet in as few as 50 years unless there is a major rapid reduction in greenhouse gas emissions. “Parts of our coastal cities would still be sticking above the water, but you couldn’t live there” (Hansen et al., 2016). Already, many living in low-lying coastlines and small island states are being displaced by sea level rise, but these numbers are dwarfed by predictions that the accelerating pace of rising seas will flood some of the world’s most populous cities—creating a tidal wave of psychosocial trauma as a bottleneck of climate refugees compete for higher ground (Hearty, 2012; Parker, 2017). In the United States alone, tens of millions live on coastlines and depend on coastline stability for their livelihoods, well-being, and survival; worldwide hundreds of millions of people live within 30 ft of sea level (McGranahan, Balk, & Anderson, 2007).

With some *acute* climate events, victims can “arm themselves” by taking actions that help protect them should they face a similar event. Sea level rise is different. Although governments can work to adopt measures to mitigate harm in the short term, future sea level rise will continue, inundating low-lying cities, countries, and islands. Fears of permanent displacement to unfamiliar places gnaw at victims, provoking additional stress—financial, social, and personal. Current and future climate refugees, who have been displaced from their homes, search for safety and security, but chaos and violence often follow them, and can spread to others along the way. Massive relocation will become necessary; it is already underway in places such as Shishmaref in Alaska, St Charles Island in LA, and now Charleston NC. Parts of Miami, FL are flooded nearly daily.

Believing that we can take action, that we are empowered to protect ourselves, is critical to maintaining our mental health. Nurturing the hope of returning home, restoring, and rebuilding after cataclysmic losses builds resilience. But no such action or hope can undo the ravages of locked in sea level rise. Layered on are the crushing financial losses of walking away from what is typically our biggest investment—our homes—now with little or no value. The plight of climate refugees is increasingly the focus of mental health professionals. The psychological stress of refugees is high. The refugees are often blamed for psychosocial ills. Katrina refugees were initially accused of precipitating a crime wave in Houston, where many were taken in, before a closer analysis showed this was a misreading of statistics (Hamilton, 2010). A flare-up of anti-refugee sentiment has rocked countries and

governments across Europe and on the American border with Mexico where the divisive battle over building a wall has further polarized the USA and precipitated a record-breaking government shutdown.

Other Sources of Climate-Related Psychological Impacts

New Disease Threats

As ecosystems are altered by climate change, old diseases are expanding their reach and new diseases are emerging. While physical health data is examined and reported, the complex psychosocial toll—difficult to quantify—often is not addressed as a result.

Warnings that new diseases and old diseases are emerging are heard frequently. Deeply unnerving, they precipitate a pervasive if not always fully conscious sense of vulnerability that adds to existing stressors in life. Millions worried, for example, about exposure to the Zika virus—with widespread repercussions: local economies took a hit as fears drove tourists away, pregnancies were put off; travel plans unraveled; and decisions about family life and individual personal choices were driven by fears of infection. Families suffered the anguish of having babies born with deformities and with the knowledge that a baby who was exposed might appear normal but have disabilities down the road.

Lyme disease is well known in some cases to leave its victims with long-lasting and painful emotional wounds. Cognitive deficits and mood disorders with depression and anxiety are not uncommon. Individuals struggle with the torment of treatments that are often ineffective, especially when the diagnosis—sometimes difficult to make—comes after years of raging infection and unexplained symptoms. Other climate-linked viruses, parasites and bacteria storm on and off stage depending on local weather conditions, or are waiting in the wings for their chance, or continue their inexorable expansion: Dengue fever, also known as “bone-break fever” because it is so painful; Chikungunya; Hantavirus; West Nile; Chagas disease; and of course, Malaria. All of them carry an attendant psychosocial toll that must be addressed.

Air Pollution

The World Health Organization reports that nine out of ten people breathe unhealthy air. Air pollution is primarily the result of our use of fossil fuels: when coal, oil, and gas are burned, they create pollutants that undergo chemical reactions to form particulate matter. Warmer temperatures speed up these reactions, causing pollution to become more concentrated. The presence of particulate matter in our bodies triggers

inflammation. Many diseases and conditions are linked to exposure to polluted air. Ultrafine particulate matter is especially worrisome because it can cross directly from lung tissue into the bloodstream and be carried throughout the entire body. Already confirmed in nonhuman primates, initial studies suggest that ultra-fine particulate matter also crosses directly from the nasal mucosa via nerve endings that transport it directly into the human brain (Obederdöster, Elder, & Rinderknecht, 2009).

Though more research is needed to address some inconsistencies, evidence is mounting that inflammation of brain tissue from air pollution is linked to dementia, including Alzheimer's type; is linked as a comorbid factor in the development of Parkinson's disease and exacerbation of symptoms; and is linked to amyotrophic lateral sclerosis (ALS) (Calderón-Garcidueñas & Villareal-Ríos, 2017; Chen et al., 2017; Lee et al., 2017; Seelen et al., 2017).

The incidence of these diseases is expected to rise and already brings a crushing economic burden in the hundreds of billions of dollars. The cost in human suffering alone should be argument enough to make eliminating the burning of fossil fuels a number one public health priority (Gladman & Zinman, 2015; Kirson et al., 2016; Kowal, Dall, Chakrabarti, Storm, & Jain, 2013).

Evidence supports a link between neuro-inflammation and classic psychiatric illness: major depressive disorders, bipolar disorder, schizophrenia, and obsessive-compulsive disorders (Souhel, Pearlman, Alper, Najjar, & Devinsky, 2013). Air pollution is also associated with increased psychosis in adolescents (Newbury, Arseneault, Beevers, et al., 2019). Even *low levels of pollution* in Sweden—primarily from traffic—are associated with an increased risk of mental illness in children (Oudin, Bråbäck, Åström, Strömgren, & Forsberg, 2016).

The [American Psychological Association reported](#) children exposed to particulate matter in the air were more likely to have symptoms of anxiety or depression (Weir, 2012). Emergency room visits for anxiety—including panic attacks and threats to commit suicide—are significantly higher on days with poor air quality (Szyzkowicz, Willey, Grafstein, Rowe, & Colman, 2010).

Vulnerable Populations

The elderly, the sick, the disabled, the poor, and those whose jobs are tied to the natural environment (farming, fishing, forestry, etc.) are particularly susceptible to the psychological impacts of climate disruption. Residents in areas destroyed by climate disasters or where fossil fuel production has destroyed the natural landscape are especially likely to suffer from “Solastalgia”: a gripping existential pain that comes from seeing places that once gave the treasured feeling of “home” now lost or irreparably damaged (Albrecht, 2005).

The mentally ill are especially vulnerable: they are less resilient, have fewer resources, face disrupted services that put them at risk of decompensation, and take psychotropic drugs that impede the ability to persevere—making them more prone to

overheating. Often overlooked groups include: first responders, who see the injuries, deaths and devastation in its rawest state; climate experts, whose professional lives are spent cataloguing the growing evidence of decline and with a growing sense of doom see their life's work damaged, destroyed or disappearing (Guest, 2014; Nicholls et al., 2014); and activists, the "Climate Cassandras", who, desperately issuing anguished warnings, and in the grip of images of future disasters they cannot get out of their minds, may suffer from "pre-traumatic stress disorder" (Van Susteren, 2013).

The poor and rural populations as well as those who live a day-to-day existence face falling income, food shortages, and rising prices. Decisions must be made about who eats and who does not. Families and communities fray when competition erodes the sharing support system that was characteristically relied upon. The world's poor suffer the anguish of climate injustice far from the consciousness of those whose overconsumption and disproportionate use of resources are most responsible. Ten percent of the world's richest are responsible for the emissions of 50% of the world's greenhouse gases (Gore, 2015).

Ocean acidification, warming, and ocean deoxygenation are impacts from climate disruption that are responsible for dramatic declines in marine life. Experts warn that without immediate dramatic action to improve the health of our oceans, within a few decades oceans will no longer have the capacity to feed millions of people who depend on them to survive. As catches dwindle from depleted sources, food production falls, jobs decline, incomes fall, and hunger rises. Cascading economic, health, social, and psychological ills follow (IPSO, 2013).

Children and young people are at special risk. The message that the planet is dying and that the survival of future generations is on the line registers in climate-aware young people. Though findings are sometimes inconsistent and more work is called for, many are *less likely* to distance or discount the warnings of scientists, educators and government agencies that the window on our ability to "act in time" is closing. They know that conditions will worsen and the cumulative destructive toll, emotional and physical, will fall on their shoulders. Children are frightened, report they are sad and angry; a bleak and pessimistic view of the future may be more prevalent in adolescents and young adults (Ojala, 2012; Strife, 2012). Chronic childhood stress, persistently driving up cortisol levels, can alter brain development, notably in the hippocampus and prefrontal cortex, with the potential to cause impaired cognition and a life-long predisposition to anxiety, depression, and susceptibility to additional stress (Carrion & Wong, 2012; Simpson, Weissbecker, & Sephton, 2011). Susceptibility to anxiety can be passed onto succeeding generations through epigenetic inheritance (Skinner, 2014). Children who experience multiple early life stressors are at greater risk for suicide (Björkenstam, Kosidou, & Björkenstam, 2017).

The first reported case of climate crisis-induced psychosis occurred in an Australian boy in 2009, who, in his drought-stricken country, refused to drink water because he feared millions would die as a result. The doctor who treated him at Melbourne's Children Hospital said he has since seen many other children suffering from climate anxiety in varying degrees of severity (Wolf & Salo, 2008).

Summary of Psychosocial Impacts

“Not everything that counts can be counted...” (William Bruce Cameron).

Personal anecdotal clinical expertise suggests that it is the inchoate, insidious, complex, and unconscious psychological states driven by climate trauma—not lending themselves to studies and precise numbers—that can be the most profoundly damaging and drive systemic emotional conditions that society will find difficult to treat and surmount. Just as the functioning of families breaks down in the face of a chaotic home environment, in the face of the turbulence from declining national security, without trust that our institutions can protect us, the fabric of society can break down. The waves of injury from climate trauma and frustration from inaction are reverberating across our communities, the workplace, and our families, cumulatively taking a toll on the national mood. Repercussions from a stressed-out national mood drive our economy, our politics, and our relations with other countries. It shapes our culture and increasingly affects how we treat each other. How will we deal with a growing state of fear from diminished productivity, conflict between haves and have-nots, callousness, and numbness in our response to suffering—“compassion fatigue”—an alienated citizenry, distrust of each other?

We can be anxious and not know why, and we can be anxious and not know it. Sometimes anxiety is manifested as anger or another emotion or state that doesn’t even suggest the root cause. We can be anxious and give it the wrong name—often if the real source is especially unsettling. We don’t always recognize the psychological toll anxiety is having on us. Much of the violence in the world can be explained by unaddressed anxiety emanating from fears of impotence and vulnerability. Climate change evokes a profound sense of both. Whether we know it or not, whether we like it or not, whether we accept it or not, we believe the climate crisis is causing varying degrees of anxiety among most of the population.

Special Message to Mental Health Professionals: Recommendations and a Call to Action

Trying to avoid thinking about climate-related issues, or other conditions that cause anxiety, is an attempt to try to control our fears, but fear and avoidance are at the root of denial and inaction.

Years of experience have shown mental health professionals how to move people beyond this state, replacing resistance with the empowering realization that the solution is to take action. As mental health professionals we know the power of words—we know how to break down defenses, put together messages that help people finally begin to understand. We get science, we get suffering, we get urgency, we get life-long consequences. We see the value of hope, we know how to engender it even in dark times. We are good at encouraging people to grow, to be conscious of the needs of others.

As we consider where the public needs to be on climate change and what we have to offer, we can see that we have largely failed to realize the *power* of our expertise.

It no longer makes sense, because of the challenges presented by the climate crisis and the unique skills we have, to confine our professional lives only to traditional roles and services in our offices, academic settings and clinics. We need activism now to *initiate* services in this time of urgency—helping people out of their denial, tending to their wounds, working to create resilience. Just as we have qualifications in other specialties—we need “Climate Mental Health Specialists” (CMHSs), who are specifically trained to offer “trauma informed care” for the many levels and kinds of distress generated by climate instability— both direct and indirect, addressing the plight of refugees and the needs of newly blended populations, helping to organize communities and collaborating with primary care and public health experts, fanning out into settings to educate and advocate.

More research is needed to identify best practices, determining societal and infrastructural resources that are truly helpful, and building upon this evidence base to train the next generation of CMHSs.

Our efforts in every sector send the message—that the fight for sane climate policy is not the exception, but the legitimate expected behavior in this time of crisis. With our understanding of the social sciences, we know that people can be persuaded to take action *just because* other people are, and promote and harness the power of social norms to accelerate the pace of change.

Our canons of ethics tell us it is our duty to protect the health of the public and to participate in activities that contribute to it.

Committed professionals are joining others to call upon our elected officials, policy makers, and other leaders to show why the public’s health is in jeopardy, what steps must be taken, and how we can use our expertise to speed up the process. Many professional organizations and academic institutions are setting up curricula for training and making collaborative declarations describing the dangers of climate change and the urgent need for action.

But at this epic moment, our unique contributions and the urgent need for global commitment have gone missing. But it does not have to stay this way—because we can change that, too.

References

- Abel, G. J., Brottrager, M., Crespo Cuaresma, J., & Muttarak, R. (2019). Climate, conflict and forced migration. *Global Environmental Change, 54*, 239–249.
- Albrecht, G. (2005). Solastalgia: A new concept in health and identity. *PAN: Philosophy Activism Nature, 3*, 41–55.
- Al-Hadramy, M.S., & Ali, F. (1989). Catecholamines in heat stroke. *Military Medicine*. Oxford: Oxford University Press.
- American Psychiatric Association (2017). *How climate-related natural disasters affect mental health*. Philadelphia: American Psychiatric Association. Retrieved February 9, 2020 from

<https://www.psychiatry.org/patients-families/climate-change-and-mental-health-connections/affects-on-mental-health>

- Baker, A. (2015). How climate change is behind the surge of migrants to Europe. *Time Magazine*. Time USA, LLC.
- Bhalla, N. (2012). Thirsty South Asia's river rifts threaten "water wars". *Discover Thomson Reuters*.
- Björkenstam, C., Kosidou, K., & Björkenstam, E. (2017). Childhood adversity and risk of suicide: Cohort study of 548 721 adolescents and young adults in Sweden. *British Medical Journal*, *357*, j1334.
- Brewin, C. R., Andrews, B., & Valentine, J. D. (2000). Meta-analysis of risk factors for posttraumatic stress disorder in trauma-exposed adults. *Journal of Consulting and Clinical Psychology*, *68*, 748–766.
- Bulbena, A., Sperry, L., & Cunillera, J. (2006). Psychiatric effects of heat waves. *Psychiatric Services*, *57*, 1519.
- Calderón-Garcidueñas, L., & Villareal-Ríos, R. (2017). Living close to heavy traffic roads, air pollution, and dementia. *The Lancet*, *389*, 675–677.
- Carleton, T. (2017). Crop-damaging temperatures increase suicide rates in India. *Proceedings of the National Academy of Sciences of the United States of America*, *114*, 8746–8751.
- Carrion, V. G., & Wong, S. S. (2012). Can traumatic stress alter the brain? Understanding the implications of early trauma on brain development and learning. *Journal of Adolescent Health*, *51*, S23–S28.
- Chen, C.-Y., Hung, H.-J., Chang, K.-H., Chung, Y. H., Muo, C.-H., Tsai, C.-H., et al. (2017). Long-term exposure to air pollution and the incidence of Parkinson's disease: A nested case-control study. *PLoS One*, *12*(8), e0182834.
- Edwards, T., & Wiseman, J. (2011). Climate change, resilience and transformation: Challenges and opportunities for local communities. In I. Weissbecker (Ed.), *Climate change and human well-being: Global challenges and opportunities* (pp. 185–200). New York: Springer.
- Folkman, S., Lazarus, R. S., Dunkel-Schetter, C., DeLongis, A., & Gruen, R. J. (1986). Dynamics of a stressful encounter: Cognitive appraisal, coping, and encounter outcomes. *Journal of Personality and Social Psychology*, *50*, 992–1003.
- Funkhouser, D. (2016) Climate may make some regions 'uninhabitable' by end of century. *State of the Planet Climate May Make Some Regions Uninhabitable by End of Century Comments*. Earth Institute, Columbia University.
- Gladman, M., & Zinman, L. (2015). *The economic impact of amyotrophic lateral sclerosis: A systematic review*. National Center for Biotechnology Information, U.S. National Library of Medicine.
- Goodman, J., Hurwitz, M., Park, J., & Smith, J. (2018). *Heating and learning* (NBER Working Paper Series No. 24639). National Bureau of Economic Research.
- Gore, T. (2015). *Extreme carbon inequality: Why the Paris climate deal must put the poorest, lowest emitting and most vulnerable people first*. Oxfam Media Briefing 02-12-2015. Retrieved on February 9, 2020 from <https://policy-practice.oxfam.org.uk/publications/extreme-carbon-inequality-why-the-paris-climate-deal-must-put-the-poorest-lowes-582545>
- Guest, R. (2014). Portraits of scared scientists reveal truth about climate change. *Lost at E Minor*.
- Hamilton, R. (2010). The huddled masses. *The Texas Tribune*.
- Hanigan, I. C., Butlera, C. D., Kokic, C. N., & Hutchinson, M. F. (2012). Suicide and drought in New South Wales, Australia, 1970–2007. *Proceedings of the National Academy of Sciences of the United States of America*, *109*, 13950–13955.
- Hansen, J., Sato, M., Hearty, P., Ruedy, R., Kelley, M., Masson-Delmotte, V., et al. (2016). Ice melt, sea level rise and superstorms: Evidence from paleoclimate data, climate modeling, and modern observations that 2 °C global warming could be dangerous. *Atmospheric Chemistry and Physics: Journal of the European Geosciences Union*, *16*, 3761–3812.
- Hauser, A. (2015). We are the Walking Dead. *The Weather Channel (features)*.

- Hearty, P. (2012). Rising seas threaten low-lying coastlines of the world: Low coastlines under watery siege. *Ecology Global Network*. Ecology Communications Group, Inc. (ECG).
- Hope, J. (2013). A review of the mechanism of injury and treatment approaches for illness resulting from exposure to water-damaged buildings, mold, and mycotoxins. *The Scientific World Journal*, 2013, 767482.
- Hsiang, S., Burke, M., & Miguel, E. (2013). Quantifying the influence of climate on human conflict. *American Association for the Advancement of Science*, 341, 1235367.
- Huffaker, S. (2015). The water wars begin in parched California as the rich fight drought restrictions. *The National Post*, June 15, 2015.
- IPSO. (2013). State of the ocean 2013 report: Interactions between stresses, impacts and some potential solutions. *Marine Pollution Bulletin*, 74, 491–552.
- Kirson, N., Desai, U., Ristovska, L., Cummings, A. K., Birnbaum, H., Ye, W., et al. (2016). Assessing the economic burden of Alzheimer's disease patients first diagnosed by specialists. *BMC Geriatrics*, 16, 138.
- Kowal, S.L., Dall, T. M., Chakrabarti, R., Storm, M.V., & Jain, A. (2013). *The current and projected economic burden of Parkinson's disease in the United States*. Movement Disorders Society. US National Library of Medicine National Institutes of Health.
- Langlois, E., Haines, A., Tomson, G., & Ghaffar, A. (2016). Refugees: Towards better access to health-care services. *The Lancet*, 387, 319–321.
- Lee, H., Myung, W., Kim, D. K., Kim, S. E., Kim, C. T., & Kim, H. (2017). *Short-term air pollution exposure aggravates Parkinson's disease in a population-based cohort*. National Center for Biotechnology Information. U.S. National Library of Medicine.
- McGranahan, G., Balk, D., & Anderson, B. (2007). The rising tide: Assessing the risks of climate change and human settlements in low elevation coastal zones. *Sage Journals: International Institute for Environment and Development*, 19, 17–37.
- Mora, C., Counsell, C., Bielecki, C., & Louis, L. (2017). Twenty-seven ways a heat wave can kill you: Deadly heat in the era of climate change. *Circulation: Cardiovascular Quality and Outcomes*, 10, e004233.
- Morin, R., & Rein, L. (2005). Some of the uprooted won't go home again. *The Washington Post Company*.
- Müller, M. F., Yoon, J., Gorelick, S. M., Avisse, N., & Tilmant, A. (2016). Impact of the Syrian refugee crisis on land use and transboundary freshwater resources. *Proceedings of the National Academy of Sciences of the United States of America*, 113, 14932–14937.
- Newbury, J. B., Arseneault, L., Beevers, S., et al. (2019). Association of air pollution exposure with psychotic experiences during adolescence. *JAMA Psychiatry*, 76, 614–623.
- Nicholls, N., Harper, A., Rahmstorf, S., Carilli, J., Buontempo, C., Santoso, A., et al. (2014). *The scientists: Is this how you feel?* Creative Commons Attribution. Retrieved February 9, 2020 from <https://www.isthisshowyoufeel.com/this-is-how-scientists-feel.html>
- Obederdöster, G., Elder, A., & Rinderknecht, A. (2009). Nanoparticles and the brain: Cause for concern? *Journal of Nanoscience and Nanotechnology*, 9, 4996–5007.
- Ojala, M. (2012). Regulating worry, promoting hope: How do children, adolescents, and young adults cope with climate change? *International Journal of Environmental Science and Education*, 7, 537–561.
- Oudin, A., Bråbäck, L., Åström, D. O., Strömgen, M., & Forsberg, B. (2016). Association between neighbourhood air pollution concentrations and dispensed medication for psychiatric disorders in a large longitudinal cohort of Swedish children and adolescents. *BMJ Open* 6:e010004.
- Ozer, E. J., Best, S. R., Lipsey, T. L., & Weiss, D. S. (2003). *Predictors of posttraumatic stress disorder and symptoms in adults: A meta-analysis*. *Psychological Bulletin*, 129, 52–73.
- Parker, L. (2017). *Sea level rise will flood hundreds of cities in the near future: Many shore communities in the U.S. face inundation in the coming decades*. National Geographic Society. National Geographic Partners, LLC. Retrieved February 9, 2020 from <https://www.national-geographic.com/news/2017/07/sea-level-rise-flood-global-warming-science/>

- Peters, M., Moscona, J., Katz, M., Deandrade, K., Quevedo, H., Iwari, S., et al. (2014). National disaster and myocardial infarction: The six years after Hurricane Katrina. *Mayo Clinic Proceedings*, 89, 472–477.
- Potera, C. (2007). Molding a link to depression. *Environmental Health Perspectives*, 115, A536.
- Raj, A. (2014). Heat-fueled rage. *Scientific American Mind*, 25, 16–17. <https://doi.org/10.1038/scientificamericanmind0114-16>
- Randall, A. (2013). Moving stories: The Sahel. *Climate and Migration Coalition*. Climate Outreach.
- Reckdahl, K. (2017). New Orleans scrambles to repair drainage system after severe flooding. *The New York Times*. The New York Times Company.
- SAMHSA. *Phases of Disaster*. U.S. Department of Health and Human Services 1-10-2018. Retrieved April 16, 2019 from <https://www.samhsa.gov/dtac/recovering-disasters/phases-disaster>
- Schleussner, C.-F., Donges, J., Donner, R., & Schellnhuber, H. (2016). Armed conflict risks enhanced by climate-related disasters in ethnically fractionalized countries. *Proceedings of the National Academy of Sciences of the United States of America*, 113, 9216–9221.
- Seelen, M., Toro Campos, R. A., Veldink, J. H., Visser, A. E., Hoek, G., Brunekreef, B., van der Kooi, A. J., de Visser, M., Raaphorst, J., van den Berg, L. H., & Vermeulen, R. C. (2017). Long-term air pollution exposure and amyotrophic lateral sclerosis in Netherlands: A population-based case-control study. *Environmental Health Perspectives*, 125, 097023.
- Shaw, W., Labott-Smith, S., Burg, M., Hostinar, C., Alen, N., van Tilburg, M., et al. (2019). *Stress effects on the body: Musculoskeletal system*. Washington, DC: American Psychological Association. Retrieved February 9, 2020 from <https://www.apa.org/helpcenter/stress/effects-musculoskeletal>
- Shenassa, E. D., Daskalakis, C., Liebhaber, A., Braubach, M., & Brown, M. (2007). Dampness and mold in the home and depression: An examination of mold-related illness and perceived control of one's home as possible depression pathways. *American Journal of Public Health*, 97, 1893–1899.
- Simpson, D. M., Weissbecker, I., & Sephton, S. E. (2011). Extreme weather-related events: Implications for mental health and well-being. In I. Weissbecker (Ed.), *Climate change and human well-being. International and cultural psychology*. New York: Springer.
- Skinner, M. (2014). Environmental stress and epigenetic transgenerational inheritance. *BMC Medicine*, 12, 153.
- Smith, M., & Myers, S. (2018). Impact of anthropogenic CO₂ emissions on global human nutrition. *Nature Climate Change*, 8, 834–839.
- Somanathan, E., Somanathan, R., Sudarshan, A., & Tewari, M. (2018). *The impact of temperature on productivity and labor supply: Evidence from Indian manufacturing*. Energy Policy Institute at the University of Chicago. WORKING PAPER. NO. 2018–69.
- Souhel, N., Pearlman, D., Alper, K., Najjar, A., & Devinsky, O. (2013). Neuroinflammation and psychiatric illness. *Journal of Neuroinflammation*, 10, 43.
- Stanke, C., Kerac, M., Prudhomme, C., Medlock, J., & Murray, V. (2013). *Health effects of drought: A systematic review of the evidence*. PLOS Currents Disasters. Jun 5 . Edition 1. <https://doi.org/10.1371/currents.dis.7a2cee9e980f91ad7697b570bcc4b004>
- Strife, J. (2012). Children's environmental concerns: Expressing ecophobia. *The Journal of Environmental Education*, 43, 37–54.
- Szyszkowicz, M., Willey, J. B., Grafstein, E., Rowe, B., & Colman, I. (2010). Air pollution and emergency department visits for suicide attempts in Vancouver, Canada. *Environmental Health Insights*, 4, 79–86.
- United Nations Office for Disaster Risk Reduction (2015). *United Nations Office for Disaster Risk Reduction (UNISDR). The Human cost of weather-related disasters 1995–2015*. Retrieved April 14, 2019, from https://www.unisdr.org/2015/docs/climatechange/COP21_WeatherDisastersReport_2015_FINAL.pdf

- Van Susteren, L. (2013). *The Bureau of Linguistic Reality*. Retrieved from: <https://bureauoflinguisticreality.com/portfolio/pre-traumatic-stress-disorder-2>
- Vins, H., Bell, J., Saha, S., & Hess, J. (2015). The mental health outcomes of drought: A systematic review and casual process diagram. *International Journal of Environmental Research and Public Health*, *12*, 13251–13275.
- Von Uexkull, N., Croicu, M., Fjelde, H., & Buhaug, H. (2016). Civil conflict sensitivity to growing-season drought. *Proceedings of the National Academy of Sciences of the United States of America*, *113*, 12391–12396.
- Weir, K. (2012). Smog in our brains: Researchers are identifying startling connections between air pollution and decreased cognition and well-being. *American Psychological Association*, *43*, 32.
- Wolf, J., & Salo, R. (2008). Water, water, everywhere, nor any drop to drink: Climate change delusion. *Australia & New Zealand Journal of Psychiatry*, *42*, 350.
- World Health Organization. (2005). *Violence and Disasters*. World Health Organization. Department of Injuries and Violence Prevention. Retrieved February 9, 2020 from https://www.who.int/violence_injury_prevention/publications/violence/violence_disasters.pdf?ua=1

Open Access This chapter is licensed under the terms of the Creative Commons Attribution 4.0 International License (<http://creativecommons.org/licenses/by/4.0/>), which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

