BEYOND STORMS & DROUGHTS:

The Psychological Impacts of Climate Change

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ACKNOWLEDGMENTS

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Partners

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ecoAmerica grows the base of popular support for climate solutions in America with research-driven marketing, partnerships, and national programs that connect with Americans' core values to shift personal and civic choices and behaviors. MomentUs is ecoAmerica's newest initiative.

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CONTENTS

Greetings,

At this point in time, most of us understand the physical impacts of climate change. Decades of research have shown that climate change will worsen droughts, exacerbate floods, and make storms and hurricanes more severe.

The third National Climate Assessment, published in May 2014, went a step beyond weather-related impacts. It also emphasized the impacts that climate change will have on society, including how climate change is expected to disrupt food production, damage infrastructure, displace communities, and put stress on our water supplies across the nation.

Governments and communities are starting to take note of these changes—many of which are already happening—and are taking steps to respond. Planners and policymakers are allocating funds to shore up infrastructure, and devising ways to maintain crop yields even in the face of changing agricultural conditions.

But the impacts of climate change won't stop at structures and systems. Climate change will also have a profound impact on human psychology and well-being, a topic that has received scant attention from researchers, policymakers, and communicators.

This is why we've produced this report, *Beyond Storms and Droughts: The Psychological Impacts of Climate Change*. It chronicles the likely psychological impacts of climate change, from stress, anxiety and depression, to loss of community identity, to increases in violence and aggression. It discusses the pathways through which these and other impacts on human well-being will arise, why some communities will be hit harder than others, and how psychological impacts will interact with physical health.

We've also included guidance to help engage the public on climate change through the lens of mental health and well-being, as well as a list of tips for preparing and strengthening communities to withstand these impacts.

Climate change is an enormous challenge for our communities, our country, and our world. But by integrating climate mitigation and preparation into our existing efforts to keep our communities running smoothly, we can make progress toward creating a more vibrant, healthy world for ourselves and for those to come.

Meighen Speiser
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EXECUTIVE SUMMARY

Research and communications about the impacts of climate change have generally focused on physical impacts, like more extreme storms, rising sea levels, and increasingly severe droughts. Psychological impacts, on the other hand, have received comparatively little attention. The goal of this report is to summarize these and other impacts on human well-being, and provide climate communicators, planners, policymakers, public health officials, and other leaders the tools they need to both respond to these impacts and bolster public engagement around climate change.

Research on the impacts of climate change on human well-being is particularly important given the relationship between understanding and experiencing climate impacts and comprehending climate change. Experiencing the direct effects of climate change sometimes makes people more likely to accept climate change, although psychological factors and people's worldviews and ideologies can complicate this link. Thus, helping people understand climate's impacts on human well-being, as this report aims to do, could be one way to increase people's willingness to take action in response to climate change.

The impacts of climate change on human well-being will vary widely. Not all individuals and communities will experience climate change in the same way. Factors that may increase communities' vulnerability to the psychological effects of climate change include the frequency and intensity of climate impacts, weakened physical infrastructure, social stressors such as racism and economic inequality, and socioeconomic and demographic variables such as lower average education levels, and large numbers of children and older adults.

The impacts of climate change on human well-being will arise through several pathways. Some impacts will arise directly from natural disasters exacerbated by climate change, like floods, hurricanes, wildfires, and heat waves. Other effects will surface as a result of the more gradual physical impacts, such as changing temperatures and rising sea levels. Still others will be born out of indirect impacts on society, like weakened infrastructure and less secure food systems.

It is important to note that we conceptualize human well-being broadly in this report. Well-being is more than just the absence of injury or disease; it is also about human flourishing and resilience.

Similarly, individual well-being is supported not only by a healthy mind in a healthy body, but by a healthy community and a healthy network of social relationships.

This report divides the impacts of climate change on human well-being into three general categories: impacts on mental health, impacts on physical health, and impacts on community health.

Major mental health impacts include increases in the incidence of stress, anxiety, and depression, as well as increases in more severe reactions like post-traumatic stress disorder (PTSD). Research indicates that women, children, and older adults tend to be especially vulnerable to the psychological impacts of climate change, especially those related to stress and anxiety. While existing research has focused primarily on the mental health effects of climate change that will come about from disasters, climate change's more gradual effects, like rising temperatures and changing landscapes, also have important implications for human psychology.

Physical health impacts run the gamut from brute physical trauma to more pernicious effects like increased incidence of infectious disease, asthma, and lung problems. These physical health impacts will likely interact with mental health impacts, which is why they are included in this report.

Climate change will also impact community health. While both mental and physical health impacts will affect communities, community health impacts of climate change are defined in this report as impacts that have a particularly strong effect on community fabric and interpersonal relationships. These types of impacts are understudied, but may include things like an increased likelihood of criminal behavior, violence and aggression, and the loss of community identity.

This report concludes with two sets of recommendations designed to help readers put research findings into action. The first set of recommendations, "Tips to Engage the Public on Climate Change," is targeted toward climate communicators and policymakers. This section provides strategies for crafting language to talk about climate change's impacts on human well-being that will help build understanding and action rather than ambivalence, anger, or resignation. A few of the top-line recommendations include giving people confidence that they can prepare for and help prevent

further climate change, focusing on local conditions and customs, and acknowledging emotions associated with climate change and its impacts.

The second set of recommendations, "Tips to Prepare and Strengthen Communities" is targeted towards people and organizations—from city planners and public health agencies to disaster relief organizations and faith-based communities—who are interested in strengthening communities' response to climate impacts. This section provides strategies that communities can use to effectively bolster their response to the uniquely human impacts of climate change. A few of the top-line recommendations include strengthening community and social networks, involving and informing the community in preparation efforts, working to create a sense of safety, and fostering optimism.

While this report outlines some of the major psychological impacts of climate change, more research is needed to understand the full spectrum of psychological impacts, and how they can be incorporated into climate preparation, communication, and engagement.

I. CONTEXT

COMPRE-HENDING CLIMATE CHANGE

There is some evidence that understanding specific impacts of climate change can help people to better understand the phenomenon of climate change itself. In some cases, learning about impacts can even spur people to take action to prepare for or help prevent climate change. This section explains why climate change is difficult for many people to comprehend, and how interaction with the physical and other impacts of climate change may help remedy this.

Climate change is often difficult to perceive. The signal of climate change is essentially lost in the noise of daily and seasonal weather variation (e.g., Hulme, 2009; Swim et al., 2009; Weber & Stern, 2011). The phenomenon seems distant from people's lives: something that will be experienced by other, faraway people at some point in the future. The very terms used to describe it, "climate change" and "global warming," draw attention to its global scale (Rudiak-Gould, 2013). To compound the problem, media often focuses on the general phenomenon and doesn't often relate climate change to more local effects (Resource Media, 2009).

Individuals' understanding of climate change is thought to increase when they learn about potential specific local climate impacts. This is in part due to the fact that potential specific local climate impacts, and the risks associated with them, are often more personally relevant than the global phenomenon of a warming climate. This is particularly true when an individual's personal knowledge of direct effects is combined with exposure to news stories about the imminent risks of climate change (Akerlof, Maibach, Fitzgerald, Cedeno, & Neuman, 2013).

Direct experience with climate change can increase individuals' understanding of climate change (Borick & Rabe, 2010, p. 796). Some studies have shown that people are more apt to accept climate change when they personally experience its impacts (e.g., Akerlof, Maibach, Fitzgerald, Cedeno, & Neuman, 2013). However, it is unclear how the experience of weather anomalies—such as abnormally high temperatures—affect beliefs and attitudes about global warming. Some studies show that simply experiencing heat in a lab room (Risen & Critcher, 2011), or being primed to think about heat (Joireman, Truelove, & Duell, 2010), can increase people's acceptance of climate change. Thus, the observed increased acceptance of climate change in studies like Akerlof et al. may not be due the effects of the weather itself. Instead, they may be due to particular weather- or temperature-related brain schemas that are activated when people experience warmer temperatures.

Worldviews and ideologies also complicate the relationship between an individual's experience of weather anomalies and his or her response to climate change. The way people perceive the world is not neutral. Instead, individuals strive to maintain a world that is consistent with the ideology and values of the their social groups (Kahan, 2012). People often interpret incoming information in a way that confirms their existing views, a phenomenon that is sometimes called motivated cognition. Because of this, individuals whose worldviews conflict with climate change realities actually may not perceive certain effects of climate change (Howe & Leiserowitz, 2013; Hamilton & Stampone, 2013). Myers, Maibach, Roser-Renouf, Akerlof, and Leiserowitz (2012) found that individuals who were either very concerned about the issue or very skeptical of climate change tended to strengthen their pre-existing belief based on their personal experience of weather. Only those respondents who were less engaged with the issue of climate change changed their beliefs based on personal experience of climate change impacts.

Most research about the relationships between experiencing local effects of climate change and comprehending climate change has focused on weather and temperature anomalies. To our knowledge, no research has examined the impact of learning about the psychological effects of climate change—such as anxiety and depression—on individuals' willingness to accept and take steps to mitigate or prepare for climate change. However, understanding the psychological impacts of climate change may provide another pathway for individuals to do so.

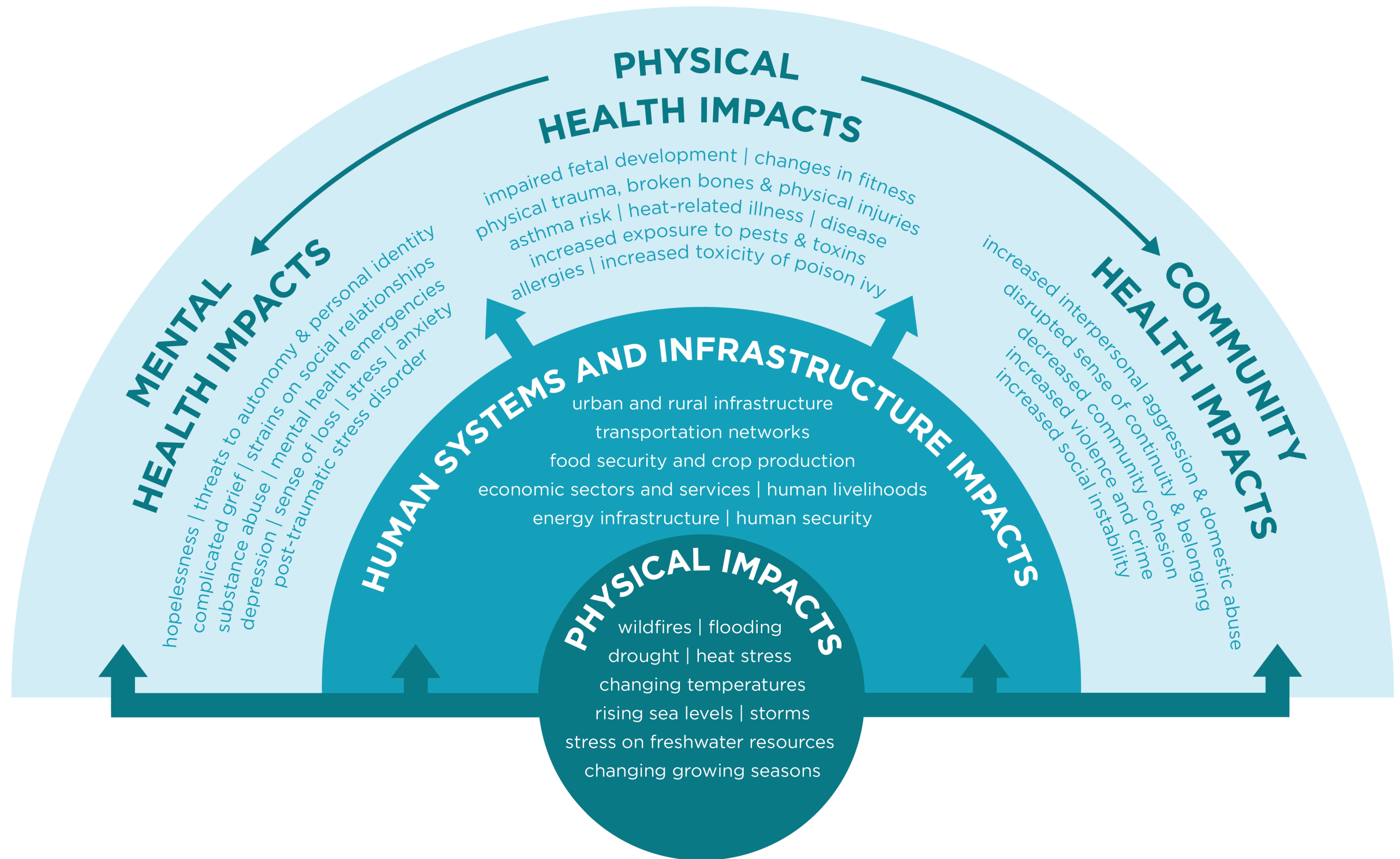## Key Takeaways: *Comprehending Climate Change*

- One reason why people may not accept or act on climate change is that the problem is often perceived as global, distant, and difficult to understand.

- Learning about the local effects of climate change can make climate change more tangible and thus make people more likely to accept it as a reality.

- Experiencing the effects of climate change sometimes makes people more likely to accept climate change, although psychological factors and people's worldviews and ideologies can complicate this link.

- Helping people understand the psychological impacts of climate change, as this report aims to do, could be one way to increase people's willingness to respond to the issue.

LINKING THE PHYSICAL & PSYCHOLOGICAL IMPACTS OF CLIMATE CHANGE

The impacts of climate change on human psychology and well-being arise through two main pathways. Some impacts will arise from the direct physical impacts of climate change, while others will arise as a result of climate change's more indirect impacts on human systems and infrastructure.

Direct physical impacts may take the form of increased severity and frequency of disasters like storms and wildfires, or more gradual impacts like changing temperatures. These impacts, in turn, affect human well-being. For example, a experiencing a disaster may lead to acute psychological conditions such as post-traumatic stress disorder.

Other impacts on human well-being will arise from climate change's impacts on human systems and infrastructure, such as disrupted food security. These impacts, in turn may cause psychological conditions like anxiety or depression. Thus, the conceptual model for this report looks something like the graphic at right.

PHYSICAL HEALTH IMPACTS

impaired fetal development | changes in fitness
physical trauma, broken bones & physical injuries
asthma risk | heat-related illness | disease
increased exposure to pests & toxins
allergies | increased toxicity of poison ivy

MENTAL HEALTH IMPACTS

hopelessness | threats to autonomy & personal identity
complicated grief | strains on social relationships
substance abuse | mental health emergencies
depression | sense of loss | stress | anxiety
post-traumatic stress disorder

COMMUNITY HEALTH IMPACTS

increased interpersonal aggression & domestic abuse
disrupted sense of continuity & belonging
decreased community cohesion
increased violence and crime
increased social instability

HUMAN SYSTEMS AND INFRASTRUCTURE IMPACTS

urban and rural infrastructure
transportation networks
food security and crop production
economic sectors and services | human livelihoods
energy infrastructure | human security

PHYSICAL IMPACTS

wildfires | flooding
drought | heat stress
changing temperatures
rising sea levels | storms
stress on freshwater resources
changing growing seasons

VULNER-ABILITY TO CLIMATE IMPACTS

While the physical effects of climate change will be felt everywhere, vulnerability to the human effects of climate change varies across individuals and communities. In this section, we describe factors that make individuals or communities more vulnerable to the psychological impacts of climate change.

Because the physical and psychological impacts of climate change are linked, communities with outdated infrastructure are often more vulnerable to the psychological impacts of climate change. Outdated infrastructure might take the form of a lack of adequate extreme weather warning system, inadequate storm surge preparedness measures, or clogged or inadequate storm sewer systems.

In addition to physical vulnerabilities, communities are less resilient when they are weakened by social stressors. Areas with high numbers of residents lacking access to health care or health insurance, or already experiencing poor health (Edwards & Wiseman, 2011) are also especially susceptible to the impacts of climate change. All of these factors leave individuals and communities with fewer physical and emotional resources to deal with climate change impacts.

A range of socioeconomic and demographic variables also play a role in shaping how vulnerable individuals and communities will be to the impacts of climate change. Factors linked to elevated vulnerability to climate impacts include high levels of poverty, lower education levels, and large populations of older adults, children and infants, disabled people, and recently arrived immigrants, migrants, or refugees, all of whom tend to demand greater access to services that climate change can put at risk (Weissbecker & Czinez, 2011).

In addition, a number of psychosocial factors affect communities' vulnerability to impacts. Lower levels of social cohesion and connectedness, greater social inequalities, lack of trust between community members and institutions, and other factors that inhibit community members from working together are all associated with greater vulnerability to impacts (Norris, Stevens, Pfefferbaum, Wyche, & Pfefferbaum, 2008).

The media and social context can also influence how vulnerable people and communities are to the human impacts of climate change. The extent to which individuals recognize climate effects, or label them as part of climate change, is partially influenced by media representations and the people around them. Whether or not people attribute certain impacts to climate change will in turn influence the way in which they experience certain psychological effects. For example, anxiety about climate change and its possible future impacts is likely to occur only when people identify climate change as responsible for particular trends and events.

Different Types of Climate Impacts: Disasters vs. Gradual Effects

In this report, we've grouped the impacts of climate change on human well-being into two categories: impacts from disasters and impacts from more gradual effects. We have chosen to use this organization rather than specifying the effects of each type of disaster or physical impact of climate change. This is because psychological and health outcomes of climate change are less dependent on the form of the impact (e.g. drought, increased temperature, hurricane, etc.) than on how severe it is, how long the effects last, and the timescale on which it onsets (Berry, Bowen, & Kjellstrom, 2010; Page & Howard, 2009).

- Disasters onset at a specific point in time and are often highly visible. Examples of disasters include floods, hurricanes, wildfires, heat waves, and droughts.

- Gradual effects build up over time and are harder to observe. Gradual effects include: slow changes in mean temperature, humidity and dew point; sea level rise; spread of disease; changes in agricultural conditions and associated increases in food insecurity; changes in natural landscapes, changes in land use and habitation and associated increases in numbers of displaced people; ecosystem disruptions; increased air pollution; and decreased availability of fresh water.

Key Takeaways: *Vulnerability to Climate Impacts*

Not all individuals and communities will experience climate change in the same way. Factors that can increase communities' susceptibility to the psychological effects of climate change include:

- Large populations of older adults, children and infants, disabled people, and recently arrived immigrants, migrants, or refugees
- Outdated physical infrastructure
- High levels of poverty
- High levels of social inequality
- High numbers of residents lacking access to health care
- Low education levels
- Low levels of social cohesion and connectedness
- Low levels of trust

- The media, as well as social networks, affect whether or not people attribute certain events to climate change, which can in turn impact the types of psychological effects they experience.

- In this report, we divide the impacts of climate change on human well-being into two different categories. The first type of impacts comes from immediate and sudden disasters like floods, wildfires, and heat waves. The second type of impacts onsets more slowly and comes from more gradual changes, like rising sea levels, increases in temperatures, and changes in agricultural conditions.

II. CLIMATE'S IMPACTS ON HUMAN WELL-BEING

IMPACTS ON MENTAL HEALTH

It is challenging for climate scientists to attribute any one single disaster to climate change (IPCC, 2012). However, strong scientific evidence does suggest that the number and severity of disasters is likely to increase (IPCC). Given previous research on the relationship between natural disasters and mental health and psychological functioning (e.g. Norris et al., 2002), we can expect a likely increase in mental health-related symptoms and conditions as a result of climate change.

In this section, we provide an overview of the ways in which climate change may impact individuals' mental health and psychological functioning, both as a result of disasters and as a result of more gradual changes in the environment, like changing temperatures and rising sea levels.

Effects of Disasters

TRAUMA & SHOCK Disasters carry the potential for immediate and severe psychological trauma from personal injury, death of a loved one, damage to or loss of personal property (e.g., home and pets), and disruption in or loss of livelihood (Neria & Shultz, 2012; Terpstra, 2011; Simpson, Weissbecker, & Sephton, 2011). Terror, anger, shock, and other intense negative emotions are likely to dominate people's initial response to a disaster (Raphael, 2007). Acute traumatic stress is typical (Fritze, Blashki, Burke, & Wiseman, 2008). Interview participants in a study about flooding by Carroll, Morbey, Balogh, and Araoz (2009) used words such as "horrifying", "panic stricken," and "petrified" to describe their experience during the flood itself (p. 542).

STRESS, ANXIETY & DEPRESSION High levels of distress and anxiety are often prevalent among people who have recently experienced an acute trauma. Well after floodwaters had receded, interviewees in a study by Carroll, Morbey, Balogh, and Araoz (2009) noted that they were still experiencing panic attacks, difficulty sleeping, low motivation, and obsessive behavior. Persistent distress and anxiety may be especially prevalent in children and youth (Simpson, Weissbecker, & Sephton, 2011). In a study of young people in a drought-affected area, Carnie, Berry, Blinkhorn, and Hart (2011) found that young people felt high levels of distress and reported being concerned about their families, overwhelmed, isolated, and worried about the future.

The direct psychological trauma of a disaster is often exacerbated by a cascade of physical impacts that onset after the disaster itself. Natural disasters can lead to structural or technological crises such

as power and communications outages, breakdown in water, sewer, and other infrastructure, or urban fires. These follow-on break-downs exacerbate the trauma and distress the disaster has already caused (Simpson, Weissbecker, & Sephton, 2011). During post-disas-ter recovery, some people report an additional stress burden from dealing with paperwork and negotiations with insurance companies or building contractors to arrange for damaged homes and property to be repaired or replaced (Carroll, Morbey, Balogh, & Araoz, 2009). All of these additional stressors add to the initial psychological burden of directly experiencing a disaster.

The initial acute trauma of the disaster is often replaced with a set of long-term psychological stressors. Stress manifests as both a subjective feeling and a physiological response that occurs when a person feels that they do not have the capacity to respond and adapt to a given situation. Stress can also be accompanied by anxiety, depression, worry about future disasters, feelings of vulnerability, helplessness, mourning, grief, and despair (Neria & Shultz, 2012). For example, Stain et al. (2011) found that people living in a drought-affected area who had also recently experienced some other adverse life event were more likely to express a high degree of worry about the ongoing drought conditions. Several studies have found that many victims of a flood disaster express psychological distress even years following the flood (Simpson, Weissbecker, & Sephton, 2011; Crabtree, 2012; Alderman, Turner, & Tong, 2012).

High levels of distress and anxiety also appear to be linked to physi-cal health effects. For example, chronic distress results in a lowered immune system response and greater risk of a number of physical ailments (Alderman, Turner, & Tong, 2012; Simpson, Weissbecker, & Sephton, 2011).

COMPLICATED GRIEF Grief is a normal reaction to trauma or disaster. In some cases, however, feelings of loss persist for so long and so severely that individuals have trouble resuming their normal lives. In a study of victims of Hurricane Katrina, Shear et al. (2011) found that approximately half of people sampled had experienced significant loss from the hurricane. Of those respondents, 29 per-cent experienced a phenomenon known as complicated grief, which is a more intense and longer-lasting form of grief than is normally experienced. Interestingly, the vast majority of cases of complicated grief in the study were caused by something other than bereaving a death.

SEVERE REACTIONS, E.G. PTSD In some cases, the psychological trauma of a disaster can lead to more severe conditions, such as major depressive disorder (MDD), or post-traumatic stress disorder (PTSD). PTSD has been studied in survivors of several recent natural disasters, including floods (e.g., Mason, Andrews, & Upton, 2010; Alderman, Turner, & Tong, 2012) and Hurricane Katrina (Lowe, Manove, & Rhodes, 2013). PTSD is often linked to higher levels of suicide—an effect seen among male farmers in Australia during periods of prolonged drought (Hanigan, Butler, Kokic, & Hutchinson, 2012). PTSD can also increase the likelihood of substance abuse, depression and anxiety, violence and aggression, interpersonal difficulties, and job-related difficulties (Simpson, Weissbecker, & Sephton, 2011). Individuals who experience multiple acute events—such as more than one disaster, or multiple years of drought—are likely to experience even more severe trauma and may be even more susceptible to PTSD and other types of psychiatric symptoms (e.g., Edwards & Wiseman, 2011; Hobfoll, 2007). For example, a study of refugees exposed to multiple traumatic events showed a higher rate of immediate and lifetime PTSD and lower probability of remission than those refugees who had experienced few traumatic events (Kolassa et al., 2010). In addition, the likelihood of suicide is higher among those who have been exposed to more severe disasters (Norris, Friedman, & Watson, 2002).

STRAINS ON SOCIAL RELATIONSHIPS As Simpson, Weissbecker, and Sephton (2011) point out, a disaster event is likely to precipitate a set of further stressors that can produce strains on social relationships. For example, families whose homes are severely damaged or destroyed by a flood, storm, or wildfire must be relocated, sometimes multiple times, before settling permanently. They may have to be separated from one another and from their systems of social support. Children may have to attend a new school or miss school altogether. Parents may find themselves less able to be effective caregivers. Family relationships may suffer. In addition, those who are able to remain in their own home may still suffer the stress of losing a sense of their home as a safe and secure environment (Tapsell & Tunstall, 2008). This can have implications for interpersonal connections, as a home provides the context for social relationships (Carroll, Morbey, Balogh, & Araoz, 2009). When the physical home is damaged, it changes the dynamic of the social relationships, most often negatively.

Populations At Risk for Mental Health Impacts: Women, Children, & Older Adults

Certain groups are at higher risk for stress and other related psychological conditions. For example, children and older adults tend to be more dependent on others for care (Simpson, Weissbecker, & Sephton, 2011) and thus more susceptible to psychological impacts.

Some evidence suggests that children are at particular risk for distress, anxiety, and other clinical mental health impacts in the aftermath of a climate-related disaster. Simpson, Weissbecker, and Sephton (2011) cite an array of difficult emotional and behavioral responses in children shortly after a disaster, such as depression, clinginess, aggressiveness, and social withdrawal. Children may be at a higher risk than adults of having such symptoms persist in the long-term: In a review of the empirical literature of disaster victim responses, Norris, Friedman and Watson (2002) report that in some studies, significantly more children than adults demonstrated continued PTSD symptoms more than two years post-disaster, and, in general, were more likely to be impaired by the disaster. In addition, chronic stress from both the acute and the more subtle impacts of climate change may change the biological stress response systems and make growing children more vulnerable to later physiological health burdens as well as mental health impairments (Simpson et al.) such as anxiety, depression, and other psychopathological conditions. Children are also at higher risk of long-term physiological and mental health stress burdens if parents are less able to care for them while themselves suffering from acute levels of distress (Simpson et al.).

Other research has reported that women are prone to greater worry and feelings of vulnerability (e.g. Trumbo, Lueck, Marlatt, & Peek, 2011) and are at greater risk for PTSD, anxiety disorder, and other adverse psychological outcomes (Corrarino, 2008; Norris et al. 2002). Relatedly, increases in domestic violence are common after a disaster (Fritze, Blashki, Burke, & Wiseman, 2008).

Drought: A Special Type of Disaster

Drought is a special case in the category of climate change related disasters. Unlike other acute disasters, the onset of drought is difficult to determine—several dry years may or may not be the beginnings of a long and significant drought phase. While some people may initially be resilient to the impacts of drought, over time drought conditions lead to significant psychological distress (Carnie, Berry, Blinkhorn, & Hart, 2011). Rural farming communities are particularly prone to the effects of drought, which not only impacts daily life, but also threatens community viability and individual livelihoods in the long term. Drought has been linked to increased incidence of suicide among male farmers (Hanigan, Butler, Kokic, & Hutchinson, 2012).

Effects of More Gradual Climate Impacts

SUBSTANCE ABUSE, ANXIETY, & DEPRESSION Climate change is likely to lead to increases in stress-related problems such as substance abuse, anxiety disorders and depression (Neria & Shultz, 2012) by increasing individuals' overall stress burden. Cunsolo Willox et al. (2012) reported increases in substance abuse and the use of mental health services in a small Inuit community in Canada in response to climate impacts. Related emotions may also surface in the form of fear or anger, feelings of powerlessness, or exhaustion (Moser, 2007).

MENTAL HEALTH EMERGENCIES There is evidence that increases in mean temperature are associated with increased use of emergency mental health services. This is true not only in regions with warm climates like Israel, Australia, and parts of the U.S., but also in relatively cooler countries such as France and Canada (Vida, Durocher, Ouarda, & Gosselin, 2012). Higher temperatures seem to provide an additional source of stress that can overwhelm coping ability for people who are already psychologically fragile.

SENSE OF LOSS As climate change irrevocably changes traditional landscapes where people live, larger numbers of people are likely to experience the type of stress and negative emotions reported by the Inuit community referred to earlier in this section (Cunsolo Willox et al., 2013). Albrecht (2011) calls this phenomenon 'solastalgia': "the lived experience of negatively perceived change to a home environment" (p. 50). This psychological phenomenon is characterized by a similar sense of desolation and loss as that experienced by people forced to migrate away from their home environment. However, solastalgia has a less sudden or acute beginning due to the slow onset of changes in one's local environment.

HELPLESSNESS, FATALISM, & RESIGNATION Watching the slow and largely irrevocable impacts of climate change unfold, and worrying about the future for self, children, and later generations may be an additional source of stress. Albrecht (2011) and others have termed this anxiety 'ecoanxiety'. Though some in the media have made fun of this condition (for an example, see Hewitt, 2008), qualitative research does find evidence of some people being deeply affected by feelings of loss, helplessness, and frustration due to their inability to feel like they are making a difference in stopping climate change (Moser, 2013).

LOSS OF AUTONOMY Climate change will intensify certain daily life inconveniences, which can have psychological impacts. Volatile weather and temperature swings in colder climates during the winter will lead to more frequent freeze-thaw cycles and impose greater wear and tear on infrastructure such as roads, bridges, and sidewalks (Seeley, 2012). Everyday inconveniences, such as potholes, will become more prevalent (Seeley). More frequent and severe thawing, as well as greater summer heat and precipitation events will damage buildings. Volatile winter temperatures will mean higher likelihood of icy streets and walkways, making mobility a challenge for everyone—particularly older adults and people with handicaps. The desire to be able to accomplish basic tasks independently is a core psychological need, central to human well-being (Deci & Ryan, 2011), and may be threatened for people who have difficulty leaving home due to dangerous conditions. In addition, the economic costs incurred by disease epidemics, lost workdays, use of medical services, etc. will likely create stress for both individuals and society, and have their own impacts on mental and physical health.

LOSS OF PERSONAL IDENTITY Losing treasured objects when a home is damaged or destroyed is one way in which climate change can significantly impair an individual's sense of self and identity. This is because objects help afford us a continuing sense of self-definition, particularly those objects that represent important moments in life (e.g. journals), relationships (e.g. gifts or photographs), or personal/family history (e.g. family heirlooms) (Dittmar, 2011). Interviewees in a study by Carroll, Morbey, Balogh, and Araoz (2009) indicated that flood victims were particularly troubled by the loss of personal possessions, such as things they had made themselves or special things they had spent time and effort to procure or maintain.

OCCUPATIONAL IDENTITY Loss of identity caused by climate change may be attributable to the effect of climate change on some types of work. Loss of identity has been observed in farmers in Australia suffering from drought (Stain et al., 2011). This is likely due to the tight relationship between identity and place-based occupations like farming and fishing (Devine-Wright, 2013). Climate change may threaten or destroy these place-bound occupations by significantly altering the natural environment.

SENSE OF CONTROL Exposure to unwanted change in one's environment can also reduce an individual's sense of control over his or her life (Fresque-Baxter & Armitage, 2012), which in turn has other psychosocial effects. Perhaps as a consequence to these threats, one study found that people who were thinking about climate change became more hostile to individuals outside of their social group and more likely to support the current social system (Fritsche, Cohrs, Kessler, & Bauer, 2012). Hostility toward individuals outside of one's social group can be a way of affirming one's own group identity in the face of perceived threat. Likewise, support for the current system may help people to maintain a perceived sense of control, but may hinder efforts to implement reforms and changes.

Post-Traumatic Growth

Long-term psychological trauma due to the acute and gradual effects of climate change is not inevitable. Studies cite the potential for individuals and communities to transform themselves both prior to and in the aftermath of adversity.

At the individual level, people possessing a combination of personal physical and psychological resources may experience what is called post-traumatic growth. These individuals come through a significant disruption with the feeling of having gained something positive, such as stronger social relationships or specific skills (Lowe, Manove, & Rhodes, 2013; Ramsay & Manderson, 2011). Some of the personal qualities that make post-traumatic growth more likely include self-esteem, willingness to problem-solve, flexibility, and optimism (Hollifield, Thompson Fullilove, & Hobfoll, 2011). In a study of low-income mothers who survived Hurricane Katrina, Lowe et al. found that optimism helped the mothers adjust and grow after the disaster. Ramsay and Manderson (2011) also suggest that having a spiritual practice helps people manage and find meaning in suffering during significant adversity, such as living through a disaster.

Key Takeaways: *Impacts on Mental Health*

Some of climate change's impacts on mental health will come about from the direct and immediate physical impacts of climate change. Others will come about as a result of climate change's more gradual impacts on the environment, human systems and infrastructure.

Some of the key impacts of climate change on mental health include:
- Trauma
- Shock
- Stress
- Anxiety
- Depression
- Complicated grief
- Severe reactions, such as PTSD and major depressive disorder
- Strains on social relationships
- Substance abuse
- Mental health emergencies
- Sense of loss
- Hopelessness, fatalism, and resignation
- Loss of autonomy and sense of control
- Loss of personal and occupational identity

Drought is a special case of natural disaster that can have particular effects due to the drought's potential to impact people's livelihoods, especially farmers'.

Women, children, and older adults may be especially susceptible to some mental health impacts.

Experiencing adversity from climate impacts is not inevitable. In some cases, adversity can result in personal and psychological growth, a phenomenon known as post-traumatic growth.

IMPACTS ON PHYSICAL HEALTH

While this report focuses primarily on the psychological and mental health effects of climate change, research indicates that physical and psychosocial health are highly interdependent. For this reason, this section provides a brief overview of the primary health effects of climate change, which may trigger, worsen, or otherwise interact with psychological impacts.

Effects of Disasters

PHYSICAL TRAUMA & DEATH All natural disasters can cause physical trauma and death. In this section, we use floods, which are the most common form of natural disaster (EM-DAT, 2011, as reported in Alderman, Turner, & Tong, 2012), as an example to describe the ways in which these impacts come about. The most common causes of mortality during floods are drowning and acute physical trauma (e.g., being struck by debris) (Alderman, Turner, & Tong). People also die during or in the immediate aftermath of floods from heart attack, heat stroke, dehydration, and stroke, particularly when they lack the necessary medical supplies (Jonkman, Maaskant, Boyd, & Levitan, 2009, p. 687 as reported in Alderman, Turner, & Tong).

MINOR INJURY & DISEASE The physical health effects of floods and other disasters don't stop at serious physical injuries. Those who simply live in the vicinity of a flood face a number of risks and difficulties, all of which impact their physical health. During the flood and in the recovery period after the flood, many people sustain non-fatal injuries such as cuts or broken bones. Floods also threaten physical health through exposure to toxic materials carried by floodwater, water-borne diseases potentially introduced through the floods (e.g., respiratory illnesses, skin infections, and gastrointestinal disease where there are poor hygiene resources), or by vector-borne illnesses (e.g. West Nile) carried by mosquitoes that capitalize on receding floodwater for breeding.

AFTER EFFECTS The direct trauma of a disaster is often exacerbated by a cascade of physical impacts that onset after the disaster itself. Natural disasters can have technological ramifications such as power outages; breakdown in water, sewer, or other infrastructure; or urban fires. In addition, disruptions in other types of services (e.g. cell phone communication or garbage and recycling services) layer additional stress and difficulty during the aftermath of a disaster. These disruptions may also impact people's physical health by making it more difficult to access health care (without a phone) or by potentially increasing exposure to pests or hazardous substances (e.g. when there is no garbage pick-up).

Effects of More Gradual Climate Impacts

HEAT-RELATED ILLNESS & DEATH Climate change is expected to increase global mean temperatures and contribute to an increase in the frequency of extreme heat events, or heat waves. Temperature extremes like these may cause heat exhaustion, heat cramps, heat stroke, and death. Prolonged exposure to heat can also exacerbate pre-existing conditions such as cardiovascular, respiratory, and cerebral diseases (Portier et al. 2010).

DISEASE, ALLERGIES, ASTHMA, POISON IVY Climate change will also affect physical health through more gradual changes in the environment. Even wealthy nations will be affected by the change in the spread of infectious diseases that is likely to accompany climate change as insect carriers such as mosquitoes and ticks increase their geographical range (USGCRP, 2009). Climate change may also produce less serious, although still significant, health effects. For example, allergy season is likely to be more severe in many places due to the higher pollen counts climate change will cause (Seeley, 2012). And the increased ozone in the air is predicted to trigger more asthma attacks. Climate change is also expected to increase the spread and toxicity of poison ivy (Mohan et al., 2006).

FETAL DEVELOPMENT Another less obvious way in which climate-related stress can affect health is through fetal development. Recent research has shown that unusually cold summer weather is associated with lower birth weight (Hartig & Catalano, 2013). This research suggests that this impact is due to the increased stress of the mother, which is known to affect birth outcomes and which may well be a response to other types of unusual weather. In general, scientific research shows that both children and developing fetuses are at particular risk from heat, malnutrition, infectious diseases, allergies, and psychological trauma, the risks of which are all projected to increase due to climate change (Perera, 2008).

GENERAL FITNESS Changes in the climate such as increased average temperatures and decreased air quality may also lead to changes in the type of activities that people engage in, particularly outdoor activities and recreation. This in turn may be associated with increased rates of obesity and cardiovascular disease. Although people may compensate by exercising in indoor environments, reduced access to the restorative potential of outdoor environments may have an indirect health impact by increasing stress (Hartig & Catalano, 2013). Conversely, droughts, floods, and changes in the availability of fertile land may lead to hunger and malnutrition, though this is less likely in wealthy countries such as the U.S. (Friel, Butler, & McMichael, 2011; McMichael, 2013).

> ### Key Takeaways: *Impacts on Physical Health*
>
> Some of the **key physical health impacts of climate change** include:
> - Severe physical trauma (drowning, heart attacks, strokes, etc.)
> - Death
> - Minor injuries like broken bones and cuts
> - Disease
> - Reduced access to health care
> - Heat-related illness and death
> - Increased exposure to pests & toxic substances
> - Allergies
> - Asthma
> - Increased toxicity of poison ivy
> - Impaired fetal development
> - Changes in general fitness

IMPACTS ON COMMUNITY HEALTH

In addition to the predicted effects on individual health and well-being, climate change will likely affect how individuals interact in communities and with each other. Psychosocial community health areas that climate change will likely affect include social identity and cohesion, as well as aggression and social relationships.

Social Identity & Cohesion

SOCIAL COHESION Increased stress traceable to climatic changes has been observed among entire communities. For example, Cunsolo Willox et al. (2013) examined the impacts of climate change on a small Inuit community. Members of the community, who all reported a strong attachment to the land, said they had noticed changes in the local climate and that these changes were having negative effects. In addition to citing increased food insecurity, sadness, anger, and increased family stress, members of the community also said their sense of self-worth and community cohesion had decreased as a result of the fact that their traditional interactions with the natural environment had changed.

CONTINUITY & SENSE OF BELONGING Rising sea levels or changing local climate conditions may render certain locations uninhabitable or undesirable, leading to a process that has been described as an "ecomigration" with resulting "environmental refugees." Adger, Barnett, Brown, Marshall, and O'Brien (2013) find that such a change can threaten both one's sense of continuity and sense of belonging.

Violence & Aggression

VIOLENCE The potential impacts of climate change on social relationships are under-researched and not well understood. One of the consequences that is most frequently mentioned, however, is the potential for increased violence. Climate change may increase violence and aggression through one of several mechanisms. First, violence and aggression may increase when competition for scarce natural resources increases, or when ecomigration brings formerly separate communities into contact and induces competition for resources like jobs and land. Second, when existing social networks are disrupted as communities dissolve, restraints on crime weaken, thus increasing the probability of criminal behavior. For example, when government resources are devoted to bolstering infrastructure to respond to natural disasters, they may be diverted away from criminal justice systems, mental health agencies, and educational institutions, all of which tend to help mitigate crime (Agnew,

2012). Third, climate change may increase conflict due to the direct impact of rising temperatures. Both lab-based experiments and quasi-experiments have demonstrated a causal relationship between heat and aggression. In other words, as the temperature goes up, so does aggression. This has led leading aggression researcher Craig Anderson (e.g., 2012) to predict a demonstrable increase in violence associated with increased average temperatures. Finally, climate change may increase violence by undermining societal stability (Agnew).

In a recent meta-analysis, Hsiang, Burke, and Miguel (2013) found clear evidence that climatic changes increased the frequency of intergroup violence, such as political conflict and war. Agnew (2012) explains that the effects of climate change are likely to promote crime by "increasing strain, reducing social control, weakening social support, …increasing opportunities for crime, and creating social conflict." And Ranson (2012) finds that between 2010 and 2099, climate change will cause an estimated additional 30,000 murders and 3.2 million burglaries as a result of increased average temperatures.

INTERPERSONAL AGGRESSION To the extent that it increases economic pressures and inequality, and decreases access to stress-reducing green spaces and supportive social networks, climate change may increase the general level of frustration in society and consequently, interpersonal aggression. Hsiang, Burke, and Miguel (2013) found that climatic changes often produce increases in interpersonal violence (such as domestic violence, assault, and rape). Furthermore, domestic abuse often increases among families who have experienced disasters, such as Hurricane Katrina (Yun, Lurie, & Hyde, 2010).

> **Key Takeaways:** *Impacts on Community Health*
>
> Some of the key **impacts of climate change on community health** include:
> - Decreased community cohesion
> - Disrupted sense of continuity and belonging
> - Increased violence and crime
> - Increased social instability
> - Increased interpersonal aggression and domestic abuse

III. APPLYING THESE FINDINGS

TIPS TO ENGAGE THE PUBLIC ON CLIMATE CHANGE

Communicating climate impacts may motivate people to engage in steps to mitigate and prepare for climate change. However, climate communicators need to be strategic and deliberate about how they talk about the psychological impacts of climate change, lest they create fear and denial rather than acceptance and action. Here, we provide 10 tips designed to help communicators and policymakers talk about psychological and other impacts in ways that help people both understand climate change and move toward solutions.

1. Give people confidence that they can prepare for and mitigate climate change. Knowledge about climate change or climate impacts is unlikely to lead to action unless people also appraise their own potential to cope and act positively. In the absence of positive coping appraisals, recognizing the threat of climate change is likely to lead people to focus their energy on managing their negative emotions by denying or avoiding the problem. But the more that people feel able to address the issue as individuals or collectively, the more likely they will be to feel a sense of hope (Koerth, Vafeidis, Hinkel, & Sterr, 2013) and overcome the denial and passivity that undermine effective response (Ojala, 2012; van Zomeren, Spears, & Leach, 2010). Even those who deny climate change may respond positively to messages of hope (Stern, 2012). Focusing specifically on what people can do to prepare for (not just mitigate) specific climate change impacts may be an effective strategy for engaging those who are less familiar with climate change, as the consequences and benefits of these efforts are sometimes more easily seen and immediately experienced.

2. Communicate specific solutions. Many communications efforts around climate change have focused on helping people understand the exact nature of the problem. Research suggests, however, that climate communication is often more effective when it focuses on solutions (Moser & Dilling, 2007; Moser, 2014). Climate communicators should incorporate a focus on solutions into programs and messages, and provide people with specific, actionable ideas about what they can do to move toward solutions in their everyday lives (Moser & Dilling).

3. Highlight co-benefits. Messages that describe the dire consequences of climate-related events that are geographically remote often inadvertently result in less concern and more hopelessness (Hart & Nisbet, 2012; Markowitz & Shariff, 2012; Myers, Nisbet, Maibach, & Leiserowitz, 2012; O'Neill & Nicholson-Cole 2009). To avoid this trap, communicators should emphasize how taking steps to

address climate change can create positive co-benefits, like economic prosperity, reduced risk, and stronger communities.

4. Acknowledge emotion. Naming fears and other emotions and showing empathy for them can help dismantle paralyzing defense mechanisms. Furthermore, communicating that being anxious, depressed, or otherwise emotional is a normal response, not something to fight against, ignore, downplay, or suppress, can help individuals process potentially overwhelming information.

5. Use personal stories. Storytelling can be an effective way of engaging individuals on climate change. Climate communicators can solicit people's stories of being impacted by climate and/or taking action to help move toward solutions in order to evoke empathy and show others how they, too, can take action.

6. Be careful with imagery. On the one hand, vivid imagery may be an effective way to increase the salience of climate change. This is because the emotional arousal and fear that such images produce can be successful in grabbing people's attention and focus. On the other hand, that same imagery may discourage action by making people feel that the effects of climate change are inevitable (O'Neill, Boykoff, Niemeyer, & Day, 2013; O'Neill & Nicholson-Cole, 2009). In contrast, images that depict different or new ways of using and producing energy (e.g. solar panels, wind farms, electric cars, or home insulation) tend to generate feelings of self-efficacy. Thus, energy-focused images might be paired with climate impact-focused images in order to accomplish the dual goals of making climate change salient, and making people feel like they can do something to address the problem. We suggest that the use of imagery in climate change communication should be carefully pre-tested and calibrated to its intended audience in order to ensure it doesn't have an effect counter to that intended. More research is needed to understand how to best leverage images to encourage engagement and action around climate change.

7. Focus on local conditions and customs. One of the best ways to make climate change relevant to people is to focus on local impacts and local co-benefits of action (Moser & Dilling, 2007). For example, Rogers, Curtis, and Mazur (2012) found that individuals who understood that climate change was impacting local conditions were more likely to take steps to prepare for them. (See also Haden, Niles, Lubell, Perlman, & Jackson, 2012; Syal, Wilson, Crawford, & Lutz,

2011). Focusing on local solutions, too, can be an effective way to build efficacy and engagement too around the issue. Thus, locally specific information may be useful in bridging the gap from concern to action on climate preparation and solutions. Local, place-based impacts may help also overcome political polarization around climate change. Place attachment, which crosses political lines, predicts willingness to engage in some adaptation behaviors, like preparing for flooding (Adger et al., 2013). In addition, taking local customs and cultures into account when developing climate change messages and programs can help ensure that residents will be receptive to them.

8. Emphasize the power of collective action. Individuals' perceptions that effective collective action on climate change is possible may be even more important than their beliefs about effective individual action (van Zomeren, Spears, & Leach, 2010). Providing a forum where people can share what they are doing, and learn about what others are doing can lead to a positive feedback loop in which actions inspire other actions and support the creation of new social norms. Emphasizing the effects of collective action may even be a way to reach those who deny climate change: Bain, Hornsey, Bongiorno, and Jeffries (2012) find that those who deny climate change are willing to engage in environmental citizenship actions if they believe mitigation efforts will have a positive effect on society.

9. Help people to accurately interpret their experience. As noted previously, individuals may not always attribute their personal experiences with climate impacts to climate change itself. People may also falsely attribute weather events to climate change. Social context, including the mass media, plays a role in influencing whether an individual perceives a particular event or phenomenon as due to climate change. While communicators should take care not to attribute any one specific weather event to climate change, they should describe how climate change is affecting long-term weather trends and how it is increasing the number and severity of extreme weather events. Research indicates that TV meteorologists in particular may be able to play a role in deepening Americans' understanding of extreme weather and climate change (Zhao et al., 2014).

10. Put it all together. There is no silver bullet to helping people make the leap from recognizing climate impacts to taking action on climate preparation and climate solutions. The strategies enumerated above are most effective when used in tandem. Thus, an ideal strategy might identify local events or experiences that most people can recognize, clarify their connection to climate change, help people to understand that solutions are possible, illustrate solutions and impacts with compelling, carefully selected visuals, promote specific behaviors that people can undertake as individuals and as a community, emphasize the co-benefits of action, use stories to help empower people and build compassion, and acknowledge the potential for anxiety and emotion.

Key Takeaways: *Tips to Engage the Public on Climate Change*

Talking about the impacts of climate change on human well-being is one way of getting more people on board with climate solutions. However, communicators need to be strategic about how they talk about these impacts. Here are 10 tips that climate communicators can use to bolster public engagement:

1. Give people confidence that they can prepare for and mitigate climate change.
2. Communicate specific solutions.
3. Highlight co-benefits.
4. Acknowledge emotion.
5. Use personal stories.
6. Be careful with imagery.
7. Focus on local conditions and customs.
8. Emphasize the power of collective action.
9. Help people to accurately interpret their experience.
10. Put it all together.

TIPS TO PREPARE & STRENGTHEN COMMUNITIES

Significant research exists on how communities can plan and prepare for climate change (e.g. Edwards & Wiseman, 2011; Moser & Boykoff, 2013). Here, however, we focus specifically on how communities can prepare for the psychological impacts of climate change, an area that has generally received less attention. While these tips are targeted toward planners and policymakers, a range of organizations—from city planners and public health agencies to disaster relief organizations and faith-based communities—can use these tips to hone their efforts to strengthen communities' response to climate impacts, before, during, and after they occur.

1. Strengthen community and social networks. How an individual fares when facing psychological adversity is not simply a matter of his or her personal resources. Individuals are embedded within larger communities, and their personal capacity to withstand trauma is increased when they are a part of a well-functioning, socially-connected community. Nearly every study of resilience emphasizes the importance of strengthening the social networks within communities and encouraging communities to create patterns of working together to overcome adversity, whether physical or psychological. From a review of the literature of survivors of the 2001 earthquakes in El Salvador, Terpstra (2011) concludes that people are better able to cope if there are community and social activities available to help them through difficult circumstances. Stain et al. (2011) similarly suggest that stronger community bonds and social connectedness, along with hopefulness, may decrease the adverse psychological effects of adverse environmental conditions such as prolonged drought.

One way of doing this in practice is creating occasions that bring people together to discuss and deliberate, forge closer social bonds, improve communication networks, and come to agreement that residents will work together and support each other when needed. At a minimum, social network strengthening may require only that community members and neighbors make an explicit agreement that they will help each other during adversity (Briggs & Weissbecker, 2011). Community planners can also devise ways to provide resources to existing social networks (Norris, Friedman, & Watson, 2002), such as churches, schools, and community groups.

2. Inform and involve the community. Scholars agree that climate preparedness planning is most likely to succeed if the community is involved (Cox, 2012; Norris, Stevens, Pfefferbaum, Wyche, & Pfefferbaum, 2008; Moser & Boykoff, 2013). Top-down disaster planning decisions can be effective in providing basic infrastructure such as emergency responder training, shelters, or emergency food, water, and energy supplies. However, given the unpredictability and unevenness of climate change impacts, there is no top-down, one-size-fits-all way to prepare a community to respond to climate change. Instead, planners should work to help communities or neighborhoods, as social units, to prepare themselves to collectively and creatively respond to psychological adversity (Cox, 2012; Norris, Stevens, Pfefferbaum, Wyche, & Pfefferbaum, 2008; Moser & Boykoff, 2013). For example, communities may want to strengthen pre-existing social and community support networks, develop plans to attend to the most vulnerable members of a community, and identify how organizations and individuals can work together to provide mental health assistance during and after disasters.

Focusing on community-level capacities may also be the most efficient and effective way to build the resilience necessary for individuals and communities to successfully prepare for and cope with the potential psychological impacts of climate change (Cox, 2012). Communities should also consider coordinating messages and efforts across government and non-governmental organizations, which can multiply the strength and validity of messages before, during, and after disasters.

3. Encourage residents to incorporate mental health into existing disaster preparation efforts. Recommendations for disaster or emergency kits often include things like food, water, supplies, and medication. Yet items that can preserve and shore up mental health are also equally important to include (Missouri Department of Mental Health, 2006). These items might include comfort items such as a family bible or other spiritual or religious items, pictures, or blankets and toys for small children, favorite foods or "treats" to supplement stable shelf food, recreational items such as books and games, and paper and writing instruments to journal or write down important information. Public agencies and other organizations may also want to encourage community members to incorporate these items into their disaster preparation kits.

4. Develop trusted and action-focused warning systems. An effective warning system for severe weather events can save lives, reduce injuries, and reduce property damage from disasters. Unfortunately, these systems do not always function as effectively as they could. This is due in part to limitations and uncertainties inherent in forecasting technologies. Yet warning systems are also often less effective because individuals ignore warnings or downplay them. Research suggests a number of factors that influence the likelihood people will take warnings seriously and take protective action. For example, people with little personal prior experience with a disaster or who don't understand the severity of possible impacts appear to be less motivated to take the warning seriously or to seek further information (e.g., Knocke & Kolivras, 2007; Lee, Meyer, & Bradlow, 2009). It is also possible that a warning system that has been wrong on numerous occasions may be perceived as unreliable, and thus is less likely to evoke a response (for a discussion, see Barnes, Gruntfest, Hayden, Schultz, & Benight, 2007).

Some research also suggests that there may be important racial differences in how individuals respond to a warning (e.g., Lachlan, Burke, Spence & Griffin, 2009). Communities should consider testing their warning systems to be sure that (1) all residents are reached, (2) all residents understand what the warning means and the steps they should take to respond to it, (3) the warnings are perceived as reliable, credible, and (4) the warnings communicate that government and other organizations are actively taking steps to care for the community. Warnings that take these factors into account may in turn decrease the likelihood and severity of psychological and other impacts on human well-being.

5. Pay special attention to vulnerable populations. As discussed throughout this report, not everyone will experience climate change in the same way. In particular, women, children and older adults are especially susceptible to the psychological effects of climate change. (See "Populations At Risk for Mental Health Impacts: Women, Children & Older Adults" on page 21.) Planners and policymakers should take this fact into account when developing programs and protocols to prepare for climate change. Planners may also choose to use existing climate risk and vulnerability maps, like those that have been used by the City of Toronto (Gower et al., 2010), to identify areas and populations that may be especially susceptible to impacts on human well-being and plan accordingly.

6. Create a sense of safety, calm, and hope. Many psychological stress symptoms stem from the early phases of a disaster (Simpson, Weissbecker, & Sephton, 2011). When people are in the throes of extreme distress and emotion (e.g., fear, anger, terror, helplessness, shock, and grief) common in the immediate aftermath of a disaster, it is crucial that the services available to them be sensitive and interactional (Raphael, 2007). In the rush to provide basic necessities and to search for and rescue missing/injured people, however, this type of compassion may not always be present. Hobfoll (2007) offers five evidence-based principles to guide intervention in the aftermath of a disaster or acute event and to move rescue workers and responders towards compassion. Communities that institute these principles, by training first responders and others, can limit the long-term negative psychological consequences and trauma of acute events. The principles include:

1. Promoting a sense of safety
2. Promoting calm
3. Promoting a sense of self and a sense of collective efficacy
4. Promoting connectedness
5. Promoting hope

7. Foster optimism. Optimism is critical to promoting effective coping in a community and among individuals. In a study of low-income mothers who survived Hurricane Katrina, Lowe, Manove, and Rhodes (2013) found that optimism helped the mothers adjust and grow after a disaster. Optimism likely contributes to a person's ability to feel positive emotions during a hard time, which may help people better recover and cope (Terpstra, 2011).

8. Shore up infrastructure to mediate psychological effects. Planners may not immediately think of infrastructure when working to prepare their communities for the psychological impacts of climate change. However, infrastructure plays an enormous role in shaping how vulnerable communities are to psychological impacts. A community with poor infrastructure is more vulnerable to the physical impacts of climate change, which in turn affect psychological impacts. Infrastructure systems that should be assessed and addressed include: energy production and distribution; communication systems; food and water supply, distribution, and quality; transportation; housing design and construction (to withstand extreme weather and heat); and health care (Edwards & Wiseman, 2011). Community mental health infrastructure should also be assessed (Weissbecker & Czinez, 2011). Public health agencies are

one channel through which adaptation and preparation of infrastructure can be encouraged and guided. Although many public health officials do not yet perceive addressing climate change as a priority for their agencies, those who perceive greater risk from climate change are more likely to have begun to address it (Syal, Wilson, Crawford, & Lutz, 2011).

9. Be sensitive to the needs of displaced people. Both acute disasters and the more gradual impacts of climate change lead to the displacement of individuals from their homes and communities, which carries the potential for significant psychological impacts. Hollifield, Fullilove, and Hobfoll (2011) outline several important considerations for preventing and assisting those displaced by climate change. To assist individuals who have been displaced, Hollifield and colleagues recommend creating screening tools to assess refugees' resource losses, both physical and psychological, along with screening tools to determine refugee needs and symptoms. Hollifield et al. also note that refugees are likely to also need counseling services and other mental health treatments from mental health professionals who have been trained to recognize and be sensitive to the challenges posed by environmental and climate change. Finally, Hollifield and colleagues recommend that the communities who will receive and host displaced people are provided with preparation, support, and information to help residents connect with newly arrived members across cultural and situational barriers.

> **Additional Resources for Responding to Psychological Needs After Disasters**
>
> Psychologists have been studying the psychological effects of disasters for quite some time, and have devised a series of models designed to prevent long-term mental health effects, such as PTSD or complicated grief. To learn more, check with emergency management personnel in your community or region, who may already be familiar with protocols commonly used immediately following major disasters. The following sites also provide helpful overviews of the steps emergency personnel and individuals alike can take to care for themselves and others:
>
> * http://emergency.cdc.gov/mentalhealth/
> * http://www.ptsd.va.gov/professional/pages/effects-disasters-mental-health.asp
> * http://dmh.dc.gov/page/disaster-mental-health-services

Key Takeaways: *Tips to Prepare and Strengthen Communities*

Planners, policymakers, and other leaders may have experience preparing for the physical impacts of climate change. However, they may be less well-equipped to plan for psychological impacts. Here are 9 tips that planners, policymakers, and other organizations can use as they prepare for and respond to the impacts of climate change:

1. Strengthen community and social networks.
2. Involve and inform the community.
3. Encourage residents to incorporate mental health into existing disaster preparation efforts.
4. Develop trusted and action-focused warning systems.
5. Pay special attention to vulnerable populations.
6. Create a sense of safety, calm, and hope.
7. Foster optimism.
8. Shore up infrastructure to mediate psychological effects.
9. Be sensitive to the needs of displaced people.

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