The Psychological Impacts of Global Climate Change

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An appreciation of the psychological impacts of global climate change entails recognizing the complexity and multiple meanings associated with climate change; situating impacts within other social, technological, and ecological transitions; and recognizing mediators and moderators of impacts. This article describes three classes of psychological impacts: direct (e.g., acute or traumatic effects of extreme weather events and a changed environment); indirect (e.g., threats to emotional well-being based on observation of impacts and concern or uncertainty about future risks); and psychosocial (e.g., chronic social and community effects of heat, drought, migrations, and climate-related conflicts, and postdisaster adjustment). Responses include providing psychological interventions in the wake of acute impacts and reducing the vulnerabilities contributing to their severity; promoting emotional resiliency and empowerment in the context of indirect impacts; and acting at systems and policy levels to address broad psychosocial impacts. The challenge of climate change calls for increased ecological literacy, a widened ethical responsibility, investigations into a range of psychological and social adaptations, and an allocation of resources and training to improve psychologists' competency in addressing climate change–related impacts.

Keywords: climate change, psychological impacts, disaster psychology, psychological adaptation

The full story of climate change is the unfolding story of an idea and how this idea is changing the way we think, feel, and act. (Hulme, 2009, p. xxviii)

Global climate change is likely to have significant negative effects on mental health and well-being, effects that will be felt most by vulnerable populations and those with preexisting serious mental illness (Costello et al., 2009; Fritze, Blashki, Burke, & Wiseman, 2008; Page & Howard, 2010). Localized and/or immediate consequences, such as injury or stress resulting from more extreme weather events or degraded landscapes, may be perceived as direct, personal impacts of climate change (Kolbert, 2006). However, for many, the psychological effects of climate change are likely to be gradual, cumulative, and/or experienced only through media and social communication (see Weber & Stern, 2011, this issue, and Reser & Swim, 2011, this issue). An appreciation of psychological impacts entails recognizing multiple meanings and cultural narratives associated with climate change (Hulme, 2009) and its complexity as a "wicked problem" whose effects are interrelated with other global phenomena, such as increased population, urbanization, and disparities in wealth (Kazdin, 2009, p. 342; Stokols, Misra, Runnerstrom, & Hipp, 2009). The concept of climate change assumes a progression of extreme weather and environmental changes at an unprecedented rate and scale. It is important to recognize that the severity of impacts is due not solely to extreme weather or other natural events following from global climate change but rather to the interaction between human systems and these events (see National Research Council, 2008). For example, psychological impacts are likely to be mediated and moderated by media representations and information technologies (Reser, 2010), resilience or vulnerability to disasters and environmental changes (Brklacich, Chazan, & Dawe, 2007), and social and cognitive factors (Leiserowitz, 2007; Weber, 2006).

This article differentiates three classes of climate change–related psychological impacts, offers examples, and discusses interrelated psychological processes and contextual factors (see Figure 1 for an overview). Acute and direct impacts include mental health injuries associated with more frequent and powerful weather events, natural disasters, and adjustment to degraded or disrupted physical environments (Albrecht et al., 2007; Costello et al., 2009; Few, 2007; Page & Howard, 2010). Indirect and vicarious impacts include intense emotions associated with observation of climate change effects worldwide and anxiety and uncertainty about the unprecedented scale of current and future risks to humans and other species (Kidner, 2007; Maibach, Roser-Renouf, & Leiserowitz, 2009; Norgaard, 2009). The psychosocial impacts of climate change include large-scale social and community effects of issues such as heat-related violence (Anderson & DeLisi, in press), conflicts over resources (Reuveny, 2008), migrations and dislocations (Agyeman, Devine-Wright, & Prange, 2009), postdisaster adjustment (Norris, Stevens, Pfefferbaum, Wyche, & Pfefferbaum, 2008), and chronic environmental stress (Albrecht et al., 2007). The effects of climate change fall disproportionately on those of less economic privilege or social status and thus have social justice implications

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that demand consideration (Agyeman, Bullard, & Evans, 2003; McMichael, Friel, Nyong, & Corvalan, 2008).

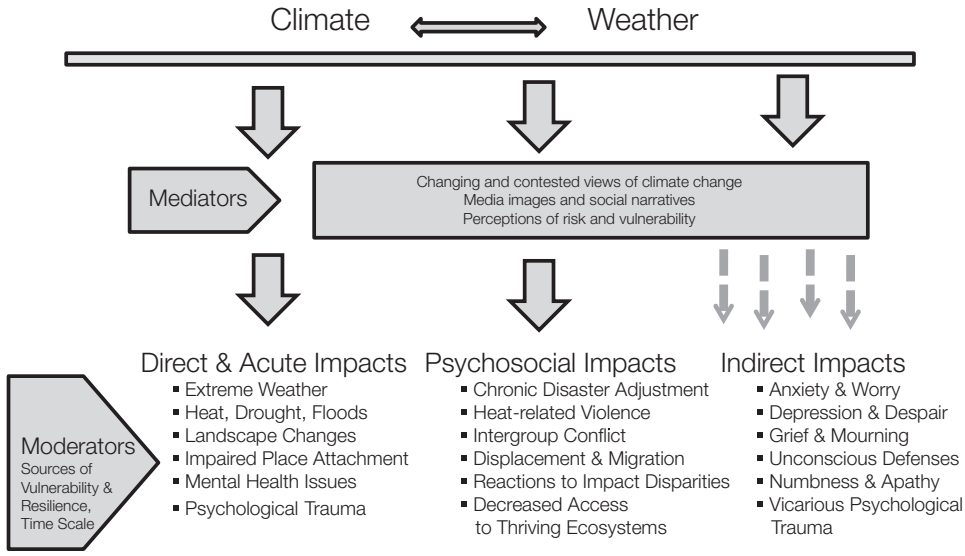
The challenges posed by issues like global climate change have prompted calls for psychologists' attention to the reciprocal and structural relationships between human health and the health and integrity of the natural environment (Clayton & Myers, 2009; Gifford, 2008; Roszak, Gomes, & Kanner, 1995; Uzzell & Räthzel, 2009). We believe that ecological literacy (Orr, 1992), an understanding of how natural systems affect each other and particularly of how anthropogenic causes can lead to indirect and unpredictable effects on the earth's climate, should be incorporated into every professional discipline that is concerned with the well-being of any part of those systems. Human well-being is implicated, and psychology should be involved. The Ethics Code of the American Psychological Association (2002) makes provisions for developing interventions in new practice areas, and an allocation of resources and training is required to improve psychologists' competency in addressing climate change and its impacts (Kazdin, 2009).

A central idea of this article is that climate change is as much a psychological and social phenomenon as a matter of biodiversity and geophysics and has impacts beyond the biophysical. We contend that there is sufficient evidence to merit a response to the psychological impacts of climate change; that these impacts co-occur on multiple, simultaneous levels; and that psychologists have an ethical obligation to take immediate steps to minimize harm, reduce disparities in climate impacts, and continually improve their climate-related interventions.

Potential Mediators and Moderators of Climate Change Impacts

Many factors can be suggested as potential mediators or moderators of responses to climate change. In particular, the social context, as instantiated in both face-to-face networks and in channels of mass communications, affects access to information, framing of that information, and vulnerability in response to the information. Personal char-

Figure 1
Climate Change: Differentiating Between Classes of Psychological Impacts



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acteristics will also affect the amount and type of information that people seek out and the way in which they respond to it. We highlight a few of the major factors.

Media Representations and Information Technologies

The influence of media representations helps explain why climate change can have psychological impacts even on individuals and communities that do not experience direct physical impacts (see Reser & Swim, 2011). Experiences of impacts often occur via virtual media representations of climate change rather than from changes in global weather patterns or ongoing environmental impacts per se (Reser, 2010; Stokols et al., 2009). Because the media have other agendas in addition to providing accurate information—for example, appealing to a particular target audience, sensationalizing a story, presenting an issue as a debate between two sides rather than as a matter of scientific fact—the message that they convey can be misleading. Dispensa and Brulle (2003), for example, found that media in the United States suggested greater uncertainty about anthropogenic climate change compared with media in other advanced nations. However, media can also moderate the response to a disaster, for example, by encouraging people to seek counseling and providing information about how to do so.

Further, exposure to information engendered by modern technologies (e.g., vivid and instantaneous Internet images) raises the salience of global crises and can engender anxiety or passivity in the face of seemingly overwhelming threats (Stokols et al., 2009). In the absence of research on effects of catastrophic climate change imagery in the media (e.g., Emmerich, 2004), potential parallels can be drawn to the wide-ranging psychological impacts of the terrorist attacks of September 11, 2001 that were associated with intense media exposure to the event (Marshall et. al, 2007).

Vulnerability and Resilience

The relative severity of climate change impacts will be moderated by sources of vulnerability and resilience: The same processes that position some people to be in harm's way (i.e., living in marginal, low-lying areas and having precarious, resource-based livelihoods) also limit their options for mitigation and adaptation (Brklacich et al., 2007). Alternatively, adaptive capacities such as economic development, uniform levels of mental health and functioning, the reduction of risk and resource inequities, and engagement of local stakeholders in disaster mitigation activities are important to community resilience and the potential to adapt successfully in the aftermath of disasters (Ebi & Semenza, 2008; Norris et al., 2008).

A proximity to the biophysical impacts of climate change, such as extreme weather events or a rise in sea level, will interact with other sources of social vulnerability (i.e., urban density, race/ethnicity, and socioeconomic status) to influence severity of disaster impacts (Brouwer, Akter, Brander, & Haque, 2007; Cutter & Finch, 2008; Few, 2007). Disaster intervention research has identified groups likely to be at greater psychosocial risk, including women, children, the elderly, the rural and urban poor, racial and ethnic minorities, those with a previous history of emotional disability, inhabitants of developing rather than developed countries, and in general, those with a marginalized predisaster existence (Haskett, Scott, Nears, & Grimmett, 2008; Norris, Friedman, Watson, Byrne, et al., 2002). In terms of climate change, individuals with mental illness are particularly vulnerable to heat-related injury and mortality due to risk factors such as the use of psychotropic medication, preexisting respiratory and cardiovascular disease, substance misuse, and poor quality housing (Page & Howard, 2010).

Social and Cognitive Factors

A sense of impact or alarm regarding climate change is likely to be both mediated by cognitive appraisals, such as estimates of personal risk and attributions of responsibility (Leiserowitz, 2007), and moderated by the responses of one's social referents. For example, in the United States, some groups perceive current danger and harm, while other groups perceive that society will be able to adapt to any adverse effects of climate change once they arrive (Maibach et al., 2009). Although both alarmed and dismissive groups tend to be highly educated, they differ on liberal versus conservative political orientation, altruistic versus individualistic values, and attitudes toward environmental protection versus economic growth. Other researchers have also noted the connection between conservative political orientation and skepticism about climate change (e.g., Feygina, Jost, & Goldsmith, 2010). One implication of this connection is that climate change is likely to affect social identity as well as personal well-being. Contextual factors such as concern about economic issues or other

immediate life stressors also moderate the importance and urgency of climate change (Pew Research Center, 2009; Weber, 2006). For example, those expressing disengagement from climate change concerns are more likely to be minority women with less education and low incomes.

Climate Change as a Natural and Technological Disaster

Although there will be variations in the biophysical manifestations of climate change and difficulty in identifying causal linkages between climatic changes and local events that affect humans, the great potential for negative impacts urges a precautionary stance (American Psychological Association Task Force on the Interface Between Psychology and Global Climate Change, 2009; Lempert & Collins, 2007). Research on psychological and social impacts associated with natural and technological disasters (e.g., Reyes & Jacobs, 2006), as well as hybrid "natech" disasters (Cruz, Steinberg, & Vetere-Arellano, 2006, p. 483), provides models and tools potentially useful in understanding the psychological impacts of climate change. Disasters are traditionally distinguished by their natural (so-called "acts of God") versus human-caused triggering events and their patterns of impacts. Natural disasters tend to have a relatively clear, linear progression of warning–impacts–recovery, in contrast to the nonlinear pattern and uncertain impacts associated with technological disasters. These events also tend to evoke differing reactions. Altruistic or community-supportive responses are associated with natural disasters, whereas uncertainty and divisiveness (often exacerbated by existing social fissures) are associated with technological disasters (Baum & Fleming, 1993; Gill, 2007).

Disasters also tend to involve distinct phases and evolving patterns of impacts ranging from the acute to the chronic (Norris, Friedman, & Watson, 2002; Stein & Meyers, 1999). Although human error and lack of preparedness may contribute to the severity of disaster impacts, technological disasters, given their human causes, are noted for a developmental sequence that includes incubation and forewarning stages as well as a postrecovery period focusing on inquiry, provision of social justice, and enactment of social and legislative reforms (Aini & Fakhrul-Razi, 2010).

The complex causes and unfolding impacts associated with global climate change blur the distinctions between natural and technological disasters and prompt individual and community responses associated with both of these types of events (Marshall & Picou, 2008). The story of climate change also acts as an overarching narrative (Hulme, 2009) that connects and frames disparate global events, influencing judgments regarding risk, responsibility, and efficacy and expectations for the future, which in turn have implications for adaptation and mitigation. (For an in-depth discussion of the social construction of climate change and its implications for psychological adaptation and mitigation, see Reser & Swim, 2011).

Direct Psychological Impacts of Global Climate Change

Extreme weather events and environmental stressors associated with global climate change are likely to have immediate effects on the prevalence and severity of mental health issues in affected communities, significant implications for mental health services, and ongoing disruptions to the social, economic and environmental determinants that promote mental health in general (Costello et al., 2009; Few, 2007; Fritze et al., 2008; Page & Howard, 2010). For example, impacts of natural disasters include acute and posttraumatic stress disorder (Galea, Nandi, & Vlahov, 2005); somatic disorders (van den Berg, Grievink, Yzermans, & Lebret, 2005); major depression (Marshall et al., 2007); and other problems such as drug and alcohol abuse, higher rates of suicide, and elevated risk of child abuse (Fritze et al., 2008). Longer and more severe heat waves associated with climate change (Meehl & Tebaldi, 2004) are also likely to be associated with increasing mortality, homicide, suicide, physical assault, and spousal abuse (Anderson, 2001; Basu & Samet, 2002; Qi, Tong, & Hu, 2009).

Experiences of mental health professionals intervening in the aftermath of Hurricane Katrina and other disasters (e.g., Haskett et al., 2008; Norris, Friedman, & Watson, 2002; Vernberg et al., 2008) have confirmed the benefits of early intervention that provides assistance with basic needs and functional recovery. Efforts that are attentive to family context and affective and emotional factors and that promote interagency cooperation and coordination are most effective in the immediate aftermath of a disaster. In the absence of clinical trials that cover the diversity of disaster circumstances, Hobfoll et al. (2007) identified empirically supported intervention principles to guide early to midstage intervention and prevention efforts, including promoting (a) a sense of safety, (b) calming, (c) a sense of self- and community efficacy, (d) connectedness, and (e) hope.

Environmental Distress and Place Attachment

The effects of climate change include gradually unfolding environmental changes, such as rising sea levels, that are associated with acute and chronic psychological impacts (Yardley, 2007). Emerging research on ecosystem health (e.g., Brown, Grootjans, Ritchie, Townsend, & Verrinder, 2005) and patterns of environmental distress resulting from dramatic human modification of the landscape provides useful models for anticipating climate change impacts. For example, through long-term studies of the experiences of inhabitants of the open pit coal-mining areas of the Upper Hunter River Valley in Australia (home to one of the world's largest coal-exporting ports), Albrecht and colleagues have validated the concept of *solastalgia*, the sense of distress people experience when valued natural environments are negatively transformed (Albrecht et al., 2007, p. S95; Higginbotham, Connor, Albrecht, Freeman, & Agho, 2007).

Indirect Impacts of Global Climate Change

The indirect, vicarious impacts of global climate change include emotional and affective responses associated with viewing images of environmental degradation or human suffering in the media or with questions of lifestyle or purchasing choices. Psychologists can validate the range and extent of these impacts, inspire supportive interventions (e.g., Macy & Brown, 1998; Randall, 2009), and describe the links between these emotional responses and behaviors associated with climate change. For example, recent interdisciplinary discussions have recognized how emotional responses to climate change, notions of responsibility and efficacy, and related adaptation processes can be understood as intertwined aspects of a psychological response to climate change threats (see Brewer, 2008; Norgaard, 2009; Reser & Swim, 2011). These processes, in turn, mediate the extent of individual and collective engagement in environmentally significant behaviors (e.g., mitigation of carbon emissions; see National Research Council, 2008, and Weber & Stern, 2011).

The Range of Emotions Associated With Climate Change

Despite the scope of the problem, personal experience with consequences of global climate change is rare in many regions of the world. Climate change does not evoke strong reactions in some individuals (Weber, 2006), while for others it is a manifestation of a "global ecological crisis" causing uncertainty and emotional distress (Stokols et al., 2009, p. 181; Böhm, 2003). Although reactions to climate change are mediated and moderated by values, beliefs, and experience, self-reported emotions about climate change are common. In the United States, a majority of people say they are interested in global warming; approximately half report feeling disgusted, hopeful, helpless, or sad about the issue, and a quarter report feeling depressed or guilty (Maibach, Roser-Renouf, & Leiserowitz, 2009). However, emotions are highest in groups at both ends of the ideological spectrum. Those in the alarmed group (18% of Americans) are much more likely to report being convinced of the reality and danger of climate change and to feel sad, disgusted, angry, or afraid. Among the dismissive group (those who are equally convinced that climate change is *not* occurring and that no response should be made, 7% of Americans), the strongest emotions were disgust and anger. Groups ranging from concerned, cautious, disengaged, or doubtful (33%, 19%, 12%, and 11% of Americans, respectively) tended to report progressively less experience of or emotional response to climate change.

Anxiety and Worry Regarding Climate Change

Individuals' worries about environmental health threats take a toll on their subjective well-being. Cognitive factors, subjective experience of stress, and selection of coping strategies determine how global conditions impinge on individuals' psyche and behavior in the context of their daily lives (Stokols et al., 2009; Wandersman & Hallman, 1993). Media accounts of "eco-anxiety" about climate change describe symptoms such as panic attacks, loss of appetite, irritability, weakness, and sleeplessness (Nobel, 2007, p. 1). Though anecdotal, these symptoms are remarkably similar to those reported in controlled studies of symptoms reported by those living in proximity to hazardous waste sites and are likely to have a genesis in autonomic stress responses and behavioral sensitization (Neutra, Lipscomb, Satin, & Shusterman, 1991).

There are challenges differentiating normal and pathological anxiety and worry regarding climate impacts. "Environmental anxiety" (Rabinowitz & Poljak, 2003, p. 225) has been characterized as obsessive and potentially disabling worry about health risks that are actually not significant (e.g., compared with well-recognized hazards such as motor vehicle accidents and smoking). Given the evidence and predictions about health impacts of climate change and the unprecedented scale of those impacts, what constitutes an appropriate level of worry remains in question. (See a discussion of functional and diagnostic implications below.)

Depressive Emotions: Guilt, Despair, and Grief

There are numerous accounts of subclinical depressive emotions, guilt, and despair associated with climate change and other global environmental issues (e.g., Buzzell & Chalquist, 2009; Norgaard, 2009; Nicholsen, 2002). Fritze et al. (2008) discussed how, "at the deepest level, the debate about the consequences of climate change gives rise to profound questions about the long-term sustainability of human life and the Earth's environment" (p. 9). In this vein, Kidner (2007) described the loss of security engendered by uncertainty about the health and continuity of the earth's natural systems and how the impact of these emotions tends to be underappreciated because of a lack of recognition of subjective feelings of environmental loss in traditional scientific and economic frameworks. Contemporary grief-loss models (e.g., Worden, 2009) view grief as a normal reaction to loss and the mourning process as a dynamic series of tasks including (a) accepting the reality of the loss, (b) processing the physical and emotional pain of grief, (c) adjusting externally and internally to a world without the lost object, and (d) finding an enduring connection with the lost object in the midst of embarking on a new life. Applying Worden's (2009) framework to adjustment to climate change, Randall (2009) described case studies of individuals drawn from the Cambridge, England, Carbon Conversations program who exhibited movement through the grief and mourning process toward a reinvesting of emotional energy in more ecologically stable life choices.

Denial as Social Justification and Psychological Defense

Speculation on the willful denial of the existence or impacts of climate change is common in the popular media (e.g., Gelbspan, 2005; Monbiot, 2006). This denial can

serve as a social justification (Norgaard, 2009) as well as a psychological defense—an involuntary mental mechanism that distorts perception of internal and external reality to reduce subjective distress (Vaillant, 2000). For example, in an analysis of a rural Norwegian community, Norgaard (2006) found that nonresponse to climate change was at least partially a matter of socially organized denial: Norwegian economic prosperity is tied to oil production, and collectively ignoring climate change maintains Norwegian economic interests. In a qualitative study using an existential-phenomenological framework, Langford (2002) identified responses to the risks posed by climate change, including (a) active denial, associated with a strong reliance on rationality over emotion and a lack of tolerance for scientific uncertainty; (b) disinterest, associated with an external locus of control and fatalism; and (c) engagement, associated with a preference for emotion and intuition to justify opinions and actions, a sense of personal responsibility, and a belief in communal efficacy. Along similar lines, Maiteny (2002) identified three responses to chronic anxiety about ecological and social problems: (a) an unconscious reaction of denial in which individuals stave off anxiety by seeking gratification through continued or increased material acquisition and consumption; (b) a "green consumer" response (p. 300) that reflects greater concern for the environment but without major changes in lifestyle; and (c) heightened conscience and feelings of connectedness with wider ecological and social processes, leading individuals to take responsibility for major lifestyle changes and to stimulate awareness in others.

Apathy Regarding Climate Change

Some commentators have characterized the public's lack of action to protect the environment as apathy. Speaking from a psychoanalytic perspective, writers such as Randall (2009) and Lertzman (2010) contend that the public's apparent apathy regarding climate change is actually paralysis in the face of the size of the problem; these writers reframe the issue in terms of psychological defense mechanisms such as splitting (i.e., retaining intellectual knowledge of reality but divesting it of emotional meaning). Moser (2007) conceptualized apathy regarding climate change as a primary emotional response associated with a habituation to the "drumbeat of news about various overwhelming environmental and societal problems" (p. 68). This primary response prevents individuals from learning about the threat and creating a more informed reaction. For Moser, numbness is seen as a secondary reaction following realization of the magnitude of climate change threats and a perceived inability to affect their outcomes. Apparent apathy regarding environmental issues may also be a function of adaptation to existing conditions. In a process Kahn (1999, p. 7) called "environmental generational amnesia," people tend to make their experience a baseline for environmental health and thus fail to recognize, over years and generations, the extent to which the environment has degraded.

Social and Community Impacts of Climate Change

In addition to direct and indirect psychological impacts, climate change is likely to have impacts on social and community relationships. Some of these impacts may result directly from changes in climate, but most are likely to be indirect results of changes in how people use and occupy territory. The effects of a changing climate on the suitability of territory for agriculture, aquaculture, and habitation means that the experiences of people in particular geographical locations, as well as the geographical distribution of populations, will be altered, with consequences for both interpersonal and intergroup relations. The severity of climate change impacts is partly dependent on other simultaneous trends and patterns. Even when the impact is restricted to one country or one part of the world, there may be economic consequences that will have spillover effects on other countries.

Heat and Violence

Climate change is most concretely represented in the public mind as "global warming" (Meehl & Tebaldi, 2004). In addition to health impacts (Poumadère, Mays, Le Mer, & Blong, 2005), the predicted warming is likely to have some direct impacts on human behavior. On the basis of experimental and correlational research, Anderson (2001) concluded that there is a causal relationship between heat and violence and that any increase in average global temperature is likely to be accompanied by an increase in violent aggression. Predictions include a rise of about 24,000 assaults or murders in the United States every year for every increase of 2 degrees Fahrenheit in the average temperature. In a more recent article, Anderson and DeLisi (in press) described some of the probable effects of climate change on violence. Both lab-based manipulations of temperature and comparisons of differences in violent crime associated with seasonal and regional temperature differences indicate that heat can have an immediate effect on violent tendencies. More subtle but possibly more powerful long-term impacts may result from an effect of heat on fetal and child development.

Climate Change and Intergroup Conflict

Global climate change is also likely to have an effect on intergroup relations. Diminishing resources set the stage for intergroup conflict, either when two groups directly compete for the remaining natural resources or when ecological degradation forces one group to migrate out of its own territory and become an immigrant into another group's territory (Costello et al., 2009; Reuveny, 2008), thus competing for rights and ownership of the space. The Intergovernmental Panel on Climate Change (2007) has estimated that by 2030, as much as 42% of the world's population will live in countries with insufficient fresh water for their agricultural, industrial, and domestic use, setting the stage for conflict over how to allocate water supplies. A review by the Global Business Network (Gil-

man, Randall, & Schwarz, 2007) found that "violent conflicts over water are already widespread" (p. 10).

The Pentagon and other institutional members of the intelligence community have begun to attend to the destabilizing effects of climate change on domestic stability as well as on international tensions (e.g., Yeoman, 2009). A report by the Oxford Research Group (Abbott, 2008) highlighted the psychosocial impact of climate change on civil unrest, noting that when governments fail to adequately protect against natural disasters or respond to their effects, people may lose confidence and trust in civil institutions, resulting in backlash.

Displacement and Relocation

Loss of connection or belonging to one's home place can also undermine mental health (Fullilove, 1996). Communities are already being forced to relocate because of current or anticipated climate changes (Agyeman et al., 2009), and it has been estimated that there may be 200 million environmental refugees by mid-century (Myers, 2002). Such forced relocations can involve a severing of emotional ties to place, disruption of existing social networks, and attempts to maintain cultural integrity despite relocation (Chaliand & Rageau, 1995; Nelson, West, & Finan, 2009). These disruptions of geographic and social connections may lead to grief, anxiety, and a sense of loss, particularly among those with a strong place or national identity.

Reactions to Socioeconomic Disparities

The growing recognition that some (primarily Western) countries have contributed more than their "share" to a global crisis that will be most strongly felt by other, less-developed countries will also exacerbate intergroup tensions. One consequence of climate change may be an increase in the disparity between the "haves" and the "have-nots" both within and between nations. Countries and people with fewer economic resources will feel the effects more strongly, because they have less ability to afford the technologies that would mitigate the financial and medical effects of climate change. Within nations, the have-nots are more likely to be ethnic minorities (Bullard & Johnson, 2000), so this disparity may also increase ethnic tensions and intergroup hostility. Intergroup relations suffered in the aftermath of Hurricane Katrina, for example, when African Americans were more likely than Whites to interpret the government's response as indicating racism (Adams, O'Brien, & Nelson, 2006). Issues of justice become more relevant when a resource is limited, and threats to one's group identity, such as that represented by a loss of homeland or a reduction in the environmental resources needed for survival, tend to increase derogation of outgroups (Hogg, 2003).

Decreased Access to Thriving Ecosystems

In terms of human health and wellness, an underappreciated consequence of climate change may be the opportunity costs represented by decreased access to thriving ecosystems. The rapid pace of climate change poses a threat to global biodiversity and ecosystem health (Wilson, 2002). Meanwhile, an accumulating body of research suggests that nearby nature has a positive effect on physical and mental health (De Vries, Verheij, Groenevegen, & Spreeuwenberg, 2003; Maas, Verheij, Groenewegen, de Vries, & Spreeuwenberg, 2006) and on social functioning (Shinew, Glover, & Parry, 2004). In urban societies, climate change may be associated with a reduction in the health of green spaces, including public parks, as ecosystems decline and as there is increased demand for the resources required to maintain them (Younger, Morrow-Almeida, Vindigni, & Dannenberg, 2008). Access to nature may be particularly important for those who are most vulnerable (Kuo & Faber Taylor, 2004). Since minority citizens and citizens of low socioeconomic status are less likely to live near parks, and may find it more difficult to reach them, a side effect of environmental degradation is likely to be increased inequality not only in exposure to environmental hazards but in access to environmental benefits.

Those who live in rural areas—such as farmers and fishers, who rely on natural resources for their economic well-being, or people whose identities are tied to a particular conception of place (cf. Burley, 2010)—are also likely to be strongly affected, directly or indirectly, by changes to existing ecosystems. Effects of climate change on the local animal and plant species are likely to have a profound effect on the human residents. Groups that rely on subsistence living are particularly sensitive to these impacts, such as indigenous inhabitants of the Arctic (Symon, Arris, & Heel, 2005).

Social Justice Implications of Climate Change Impacts

The ethical implications of sharing one atmospheric commons are that some regions are disproportionately affected by climate change and that societal vulnerability to those negative impacts is also highly uneven because of differential levels of exposure and sensitivity to the risks and differential abilities to cope and adapt (McMichael et al., 2008; Roberts & Parks, 2007). A focus on the global inequalities of climate change impacts shifts the discussion from scientific-technical issues to human rights and environmental justice (Agyeman et al., 2003). There are clear relationships between environmental risk, poverty, and vulnerability: Paradoxically, the people that face the highest risk of impacts are the least well prepared, both in terms of individual preparedness and community-level resources for disaster relief (Brouwer et al., 2007). Mental health provision in many low- and middle-income countries is already inadequate (Jacob et al., 2007), and further, in the period following a disaster, medical and psychiatric care can dramatically diminish (Jones et al., 2009; Sontag, 2010).

Coping With Climate Change Impacts

Psychologists are well positioned to provide guidance on what constitutes healthy coping with the psychological impacts of global climate change and to intervene in situations of mental health injury or disordered adjustment.

Optimal coping with the threat and unfolding impacts of climate change is likely to entail a number of factors, including accurate recognition of risks, effective management of emotions and problem solving, a focus on prosocial outcomes, and engagement in actions that have a reasonable chance of mitigation and adaptation (see American Psychological Association Task Force on the Interface Between Psychology and Global Climate Change, 2009; Gifford, 2011, this issue; Reser & Swim, 2011; Weber & Stern, 2011).

Therapeutic Considerations

From a therapeutic perspective, consideration of disordered adjustment, in particular to the indirect or vicarious psychological impacts of global climate change, poses a number of philosophical and diagnostic questions. These include distinguishing between pathological and adaptive reactions to environmental issues in general, differentiating between pathological despair about issues such as species extinction and normal bereavement, and determining what is expected regarding coping with the unprecedented health threats posed by climate change. Responses to psychological impacts associated with climate change can be characterized similarly to the way in which other issues of psychological adjustment are characterized. For example, in clinical terms, adjustment disorders are associated with discrete and short-term stressors as well as chronic stressors that have enduring consequences (American Psychiatric Association, 2000); these stressors all have qualities associated with the effects of global climate change. If one extrapolates from current diagnostic criteria, disordered adjustment to climate change impacts would include marked distress that is in excess of what would be expected given the nature of the stressor (i.e., in the context of one's community or social group) or significant impairment in social or occupational functioning, including depressed mood, anxiety, and disturbances of conduct.

In the context of mitigating or adapting to the threat of climate change or other natural disasters, worry can be considered a normal, adaptive process that prepares people to cope with future threats, unless it is so driven by anxiety that it becomes intense and uncontrollable (Barlow, 2002; Reser, 2004). Again, extrapolating from current diagnostic guidelines, differentiating between normal and pathological worry regarding climate change includes examining the content and pervasiveness of climate-related worries, interference with functioning as a result of worry, and the degree of perceived control over the worry process.

Creativity and Empowerment

Following Frumkin (2001, p. 234), a "beyond toxicity" perspective can also be taken regarding the psychological impacts of climate change. The challenges of climate change may also "galvanize creative ideas and actions in ways that transform and strengthen the resilience of and creativity of community and individuals" (Fritze et al., 2008, p. 9). As De Young (1996) noted with regard to recycling, there are intrinsic benefits to be gained from pro-environmental behavior, including a sense of frugality, participation, and competence. Research on some youth conservation programs has shown preliminary evidence that participants gain in self-efficacy, social competence, and sense of civic responsibility (Johnson, Johnson-Pynn, Sweeney, & Williams, 2009). As noted above, qualitative analyses by Langford (2002) and Maiteny (2002) suggest that some individuals respond to the threat of climate change with social engagement, which leads to a sense of empowerment and other positive emotions.

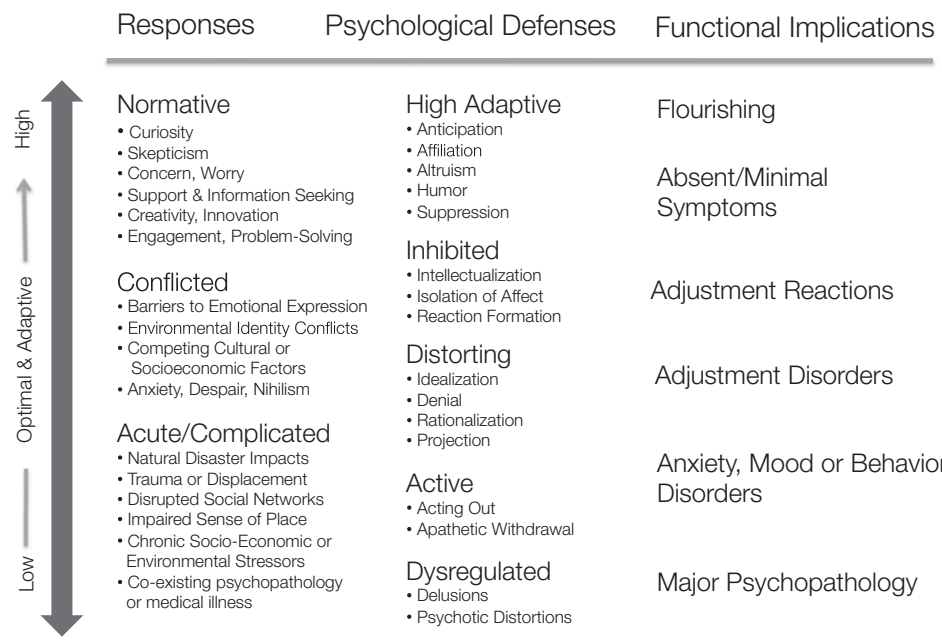
A provisional, trans-theoretical framework for categorizing responses to climate change impacts, associated psychological defense mechanisms, and functional implications is illustrated in Figure 2. Understanding individual psychological responses and their adaptive benefits is contingent on contextual factors including time frame, individual and cultural differences, social influences, and community resources. A range of adaptive responses includes curiosity, concern, skepticism, or creativity; impulses toward conservation behaviors or competing impulses toward other prosocial interests or causes; and high adaptive ego defenses—anticipation, humor, suppression. Maladaptive, acute or disordered responses include trauma or displacement associated with disasters, environmental changes, or regional conflicts; chronic stress; anxiety or depressive disorders; co-morbidity with existing psychopathology or medical illness; acting out or other dysregulated defenses. Between these two poles lies the potential for psychological distress, inhibition, or internal conflicts, including an inability to articulate environmental concerns or impacts; feelings of hopelessness or nihilism; competing motivations related to personality, social, or socioeconomic factors; and compromise-level or reality-distorting defenses, including intellectualization, denial, or projection.

Conclusion

The mounting evidence for the magnitude and irrevocability of global climate change and its psychological impacts has implications for psychologists' interventions, policies, and research. Indeed, recognition that the psychological impacts of climate change pose a current threat to individual and community health—even to those who have not directly experienced biophysical impacts—has the potential to lead to more active mitigation and adaptation activities.

In addressing the direct and acute psychological impacts of climate change resulting from more frequent and powerful weather events and adjustment to changing landscapes, psychologists can employ interventions drawn from disaster psychology and support long-term adjustment that recognizes varied responses to natural and technological disasters and the influence of secondary or chronic impacts. To address the indirect, vicarious impacts of climate change, psychologists can provide individual and group interventions to facilitate emotional expression and dialogue and create self-efficacy by fostering effective mitigation and adaptation behaviors. Psychologists can help in promoting an understanding and response to the large-scale psychosocial impacts resulting from regional environmental degradation, scarcity of resources, increased intergroup

Figure 2
Responses to Global Climate Change: A Provisional Psychological Framework



conflicts, forced migrations, loss of homeland, and threats to cultural practices and values. Global climate change is currently impacting the health and relationships of the earth's most vulnerable individuals and communities. Psychologists can address factors contributing to the social and economic disparities of climate change impacts and highlight how seemingly local and faraway impacts can manifest globally.

To ensure effectiveness in mitigating the psychological impacts of global climate change and fostering successful adaptation, more research is needed. Pressing questions include the following:

- How is the response to environmental problems that result from climate change similar to the response to natural and technological disasters (e.g., involving the same distinct phases)? Are there differences that are due to the perceived human causality and/or the ongoing nature of the problem?
- What are the interrelationships between individual and personality variables (e.g., openness to experience, optimism, neuroticism) and psychological processes, including coping and defense mechanisms (e.g., mindfulness vs. avoidance), psychopathology (e.g., preexisting mental or emotional disorders), socioeconomic vulnerability, group norms, and media and cultural messages regarding climate change?
- What are the most effective therapeutic interventions targeting individual and community health impacts of climate change? In particular, are there differential reactions to the interventions among members of different racial, ethnic, and gender groups and communities?
- What is the effect of environmental disasters on sense of place and place attachment?
- How are different cultures likely to be affected by climate change, in ways that are both concrete (loss of homeland) and more abstract (changes in cultural practice and values)?
- What is the impact of climate change and the associated scarcity of natural resources on intergroup relations?
- How can educational interventions promote positive responses such as empowerment, involvement, and efficacy in mitigating and adapting to the psychological impacts of climate change?

Global change is as much a psychological and social phenomenon as a matter of biodiversity and geophysics and poses threats to psychological health and well-being on multiple, simultaneous levels. Psychologists have an ethical obligation to take immediate steps to minimize the psychological harm associated with climate change, to help to reduce global disparities in climate impacts, and to continually improve their climate-related interventions through coordinated programs of research and practice that draw on the rich diversity of psychologists' skills and training.

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