Expanding the Role for Psychology in Addressing Environmental Challenges

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Abstract

Environmental challenges, though daunting, present an important area for psychologists to apply their knowledge. Psychological theories, research methods, and interventions are essential for examining the questions about human impacts, tendencies, and capacities that are integral to constructing effective responses to these challenges. Although a great deal of relevant research has been done, there is scope for psychologists to be more extensively involved. Following a brief review of existing research, we outline some important new directions. We also highlight two key divergences, arguing that psychological research needs to expand beyond a traditional, theory-based and decontextualized approach to environmental issues to incorporate a contextualized or 'place-based' approach and a willingness to collaborate in interdisciplinary research teams that focus on specific environmental problems. Suggestions for promoting such interdisciplinary collaborations are reviewed. We encourage psychologists to expand their engagement with important environmental issues through multiple research approaches in order to further their understanding of human behavior, contributions to human wellbeing, and relevance to other disciplines and to society.

Keywords: natural environment, training, climate change, interdisciplinarity

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Twenty years ago, a task force for the American Psychological Association delineated a research agenda for the psychological study of environmental problems (Cvetkovich & Wener, 1994; Veitch & Cvetkovich, 1995). This agenda recognized that, "The science of psychology applied to issues of human–environment relationships can contribute in important ways to evaluating and shaping environmental policy as well as generally increasing awareness of the connection of humans to their social-cultural and physical environment" (Cvetkovich & Wener, p. 1). The importance of such research is increasingly apparent. Not only are human impacts on the planet evident, for instance in global climate change and loss of biodiversity (Millennium Ecosystem Assessment, 2005; Intergovernmental Panel on Climate Change, 2013); there is also growing recognition of the extent to which human actions are needed to address the problem, and the ways that human tendencies, such as biases in risk perception, political resistance and reactance, and affect, can impede efforts to do so.

The multi-faceted nature and global scale of environmental problems and solutions highlights the need for psychologists with a wide range of expertise to address these problems and to place their work in both international and interdisciplinary contexts. In addition to the 1994 task force report, several key papers in *American Psychologist* have made this case previously. Stuart Oskamp (e.g., 2000) and Paul Stern (e.g., 2000a) have long been arguing for the relevance of psychology to environmental topics; Alan Kazdin (2009) focused on climate change in his keynote address as APA president, and emphasized the need for psychologists of many specialties to get involved; and a series of 2011 papers reported on the results of an APA task force on global climate change (e.g., Swim et al., 2011). Awareness of these issues among

psychologists is increasing. Two decades after the earlier task force, however, we believe there are both the need and the potential for psychologists to accelerate their efforts to understand and address environmental problems.

In this paper we review progress to date, and propose an expanded agenda for the psychological study of human-environmental relationships, both to advance the contributions of psychologists to this increasingly important topic area and to assist in the development of sustainable solutions to environmental problems. We include some practical suggestions to promote interdisciplinary collaborations addressing environmental challenges. Our goal is to inspire greater involvement of psychologists in the study of environmental problems and solutions by identifying the matches between our expertise and the important challenges we face, as well as promising directions for future research.

The Need for Psychological Science to Address Environmental Challenges

Most citizens of developed nations have some awareness of the environmental problems that confront society: climate change, species loss, and pollution, to name a few. However, many people, including many psychologists, are unfamiliar with the ways that psychology can contribute to understanding and addressing these problems at both local and global scales. One reasons for this is that the topic is absent from most introductory psychology textbooks and from the curricula of many psychology departments (Koger & Scott, 2007; Oishi & Graham, 2010). In recent years, psychological research on environmental problems has yielded important insights in how to improve human-environment relationships (Bamberg & Möser, 2007; Gifford, 2014; Osbaldiston & Schott, 2012; Steg & Vlek, 2009; Swim et al., 2011). As a profession concerned with human thriving and potential, psychology has to be involved in the response to environmental challenges.

Human capacities are fundamental to environmental challenges for three broad reasons. First, human behavior is largely responsible: rapid growth in population and consumption mean that more territory is developed for human habitation and production, more natural resources are being consumed, and more dangerous byproducts of production are released into ecosystems (Oskamp, 2000; Swim, Clayton, & Howard, 2011). The result is climate change, pollution, depletion of natural resources, and reduced biodiversity. Second, human responses often do not capitalize on and sometimes impede opportunities for successful mitigation and adaptation. Cognitive limitations and biases skew our interpretations of the evidence, emotional defenses encourage denial and group polarization, and other motivations may override pro-environmental intentions (Guber, 2013; Steg, Bolderdijk, Keizer, & Perlaviciute, 2014). Third, human life and wellbeing are increasingly affected. From the acute impacts of disasters like hurricanes and floods, to anxiety about global environmental change and the societal inequities of disparate vulnerability and impact, individual and social wellbeing are profoundly threatened as a consequence of environmental changes (Clayton, Manning, & Hodge, 2014; Patz, Frumkin, Holloway, Vimont, & Haines, 2014).

Effective responses to today's environmental problems require coordinated actions among diverse environmental actors, such as users, experts, and decision makers. These responses must be sensitive to the ways in which people think, interact, and behave. The field of psychology is uniquely equipped to identify the human dimensions of environmental problems at both local and global levels, and by doing so we can more accurately describe the environmental problem as a *human-environment* problem; that is, a problem of the interaction between humans and their environment. Once the problem has been defined, psychologists are key to understanding the environmentally significant behaviors, perceptions, motivations, and

(in)abilities that contribute to the problem, and to identifying and integrating human dimensions into solutions. More fundamentally, psychologists can help reframe the situation so that humans are not broadly defined solely as the source of environmental problem – and thus as a vague external factor disrupting healthy ecosystems – but as an integrated component of any ecosystem, or 'socio-ecological system' (Ostrom, 2009). As such, humans not only exert influence on, but are also influenced by, the ecological environment.

What Psychological Science Can Contribute to Understanding Environmental Problems

The agenda laid out 20 years ago by the APA taskforce has guided work and continues to be relevant. This taskforce identified several important research directions. One, which has probably attracted the most research, focused on avenues to foster environmentally responsible habits, decisions, and choices (Gifford, 2014; Schultz & Kaiser, 2012; Steg, Bolderdijk, Keizer, & Perlaviciute, 2014; Steg & Vlek, 2009). The earlier taskforce linked this to a second focus, research that focuses on the environment as a source of information that needs to be processed and interpreted, with particular emphasis on the factors that influence the perception of environmental risks (Kazdin, 2009; Weber & Stern, 2011). Such research, with its implications for message framing and communication, is crucial to guide initiatives aimed at increasing public awareness about environmental problems and guiding environmental decision-making.

A third research line proposed in the earlier agenda focuses on the effects of environmental problems on psychological health (e.g., Evans, 2001; Stokols, Misra, Runnerstrom, & Hipp, 2009). They identified pollutants as well as loss of habitat as important environmental factors; we would now also emphasize climate change and associated impacts. The breadth of this research is expanded when one also includes the growing body of work on the positive effects of environmental conditions, particularly nature (Hartig, Kaiser, & Bowler,

2001; Kaplan, 1995) and the relationship between pro-environmental behavior and wellbeing (Corral-Verdugo, 2012; Kasser, 2009; Taufik, Bolderdijk, & Steg, 2014; Venhoeven, Bolderdijk, & Steg, 2013).

Expanding the definition of health to include human well-being and social justice, the earlier taskforce addressed the need to focus attention on managing conflict and promoting sustainable communities. There is a small but growing literature on the social impacts of environmental issues such as global climate change in specific locations and communities (e.g., Hsiang, Burke, & Miguel, 2013), and awareness that the depletion of natural resources particularly affects those who are most vulnerable and least resilient to these problems, making social equity issues salient (e.g., Doherty & Clayton, 2011; Myers & Kulish, 2013; Reser & Swim, 2011). The connections between environmental and human health were recognized in American Psychologist as long ago as 1976 (Bass & Bass), but linking these issues to global environmental changes has gained new traction in recent years. It is a topic that merits greater attention, particularly from clinicians and counselors.

We identify three key lines of psychological research as especially relevant to environmental challenges. They roughly correspond to the topics identified by the earlier task force, but we draw the boundaries somewhat differently, distinguishing between behavior and perceptions and grouping individual and societal well-being under one heading. We review research progress in each area before suggesting some directions that deserve more emphasis. See Figure 1.

Insert Figure 1 about here

Understanding and Promoting Sustainable Behavior

The field of psychology is in a unique position to offer theoretical frameworks and empirical methods to describe, model, and predict (environmentally significant) behavior. Whereas other disciplines within the social sciences tend to focus either on individual decision-making and behavior or on broader social forces, the psychological research perspective encompasses both by considering the role of multiple factors, often nested at multiple levels (e.g., cognitive, social, economic, cultural) – including and in addition to those that directly bear on individual economic self-interest. This enables psychological research to inform the development of programs and policies targeting multiple motivations designed to reduce negative human impacts on the environment through behavior changes.

Psychology can draw on established research from social psychology about effective ways of providing information and about the role of social norms in determining behavior (e.g., Abrahamse & Steg, 2013). It can also provide useful information about other approaches. For example, it can inform and improve a popular price-based approach to environmental problems by integrating this strategy into a wider variety of other psychological motivations and processes that affect environmental behavior, including ethical or normative considerations, affect, and identity or status-related concerns (e.g., Steg et al., 2014). Research shows that attempts to encourage more sustainable behavior based on financial incentives can sometimes undermine more intrinsic motives and ultimately have a negative effect on sustainability. In a field study by Bolderdijk, Lehman, and Geller (2012) that aimed to encourage drivers to check their tire pressure, drivers who were reminded of the economic benefits were less influenced by the message than were those who received a message about environmental benefits. Psychological processes can moderate the effects of price, define conditions in which price based approaches may backfire, or indicate alternatives to exclusively economic approaches to environmental

solutions (e.g., Abrahamse, Steg, Vlek, & Rothengatter, 2005; Frey, 1993; Goldstein, Cialdini, & Griskevicius, 2008; Stern et al., 1986).

Even when the solution to an environmental problem involves a technological "fix" or policy intervention, individual responses to the technology or policy will influence its effectiveness. Dreyer and Walker (2013), for example, found through regression analyses of over 600 Australian adults that perceptions of fairness were positively associated with both acceptance and support of the Australian policy requiring businesses to pay for their carbon emissions. (The policy has since been repealed, suggesting that there may have been too many people who saw it as unfair – or that businesses had more clout.) Psychologists can explain shifts in public perceptions and acceptance of policies, as well as the adoption and use of technologies in ways that impact their environmental footprint (Carrico, Padgett, Vandenberg, Gilligan & Wallston, 2009; Truelove, Carrico, & Thabrew, 2015).

Psychology can also contribute to the strategic selection of behavioral targets. This requires a consideration of both the environmental impacts of a behavior as well as the likelihood that a behavior can be changed through external intervention (Dietz, Gardner, Gilligan, Stern, & Vandenberg, 2009; McKenzie-Mohr, 2000). High impact behaviors such as food preferences and personal motor vehicle usage may be difficult to change because they are governed by deeply held social and cultural norms and often impacted by infrastructures that preclude alternative options. Psychologists can contribute a better understanding of the factors that influence a specific behavior, and therefore help in identifying optimal solutions, including which behaviors to target and which intervention tools are likely to be most effective.

For example, recent work associated with the Nashville Yard Project paired an analysis of lawn care practices among urban and suburban residents in Nashville, TN with an assessment

of the net greenhouse gas emissions (GHG) that result from lawns. The researchers developed a model of turf grass yield and emissions that included inputs of the biophysical features of the turfgrass system, meteorological conditions, and a range of common lawn management behaviors derived from survey data. Their results suggested that, on average, lawns are net emitters of greenhouse gases; however, the global warming potential of lawns is highly sensitive to how they are managed (Gu, Crane, Hornberger, Carrico, 2015). Mowing and the application of synthetic nitrogen fertilizer are the most effective behaviors to target in order to reduce lawn-related greenhouse gas emissions (Gu et al., 2015). However, survey data suggested that many residents might be resistant to modifying these actions due to their personal preference of maintaining a "lush, green lawn," and a strong sense of obligation to meet the expectations of neighbors (Carrico, Fraser, & Bazuin, 2012). Further analysis revealed that residents could achieve the desired lawn aesthetic without the need for synthetic fertilizer, by recycling lawn clippings rather than removing them from the lawn. This research illustrates the way psychology can join forces with other sciences to determine behaviors that have the potential for change as well as to have environmental impact.

Understanding (Risk) Perceptions

In general it is assumed that perceptions of environmental risk focus attention and motivate protective actions. Indeed, people may refrain from engaging in pro-environmental actions because they are do not perceive the effect of their behavior on increasing or decreasing environmental risks; providing tailored information and feedback about the impact of one's behavior on the environment can be effective to encourage pro-environmental actions (Abrahamse, Steg, Vlek, & Rothengatter, 2007). Taking into account the uncertainties characterizing environmental changes, it is critically important for public policies that address

environmental issues to incorporate research on perceptions of environmental risk, the factors that influence these risk perceptions, and how these perceived risks motivate action. This includes actions focused on environmental conservation, as well as on resilience to environmental change within human systems ranging in scale from neighborhoods to societies.

In fact, we know that risk perceptions are constrained and shaped by many factors outside of the objective content of the threat, such as the recency or rarity of extreme events (Weber, 2006), and the extent to which a potential threat conforms to a sociocultural worldview (Feinberg & Willer, 2011) or values (Perlaviciute & Steg, 2015; Steg et al., 2014). Beyond impacts on "perceptions" conceptualized at a purely cognitive level, reactions to environmental risks are influenced by social groups and political ideology (Weber & Stern, 2011). Psychological research has uncovered differences among various environmental actors in risk perception and communication. Differences between environmental experts or decision-makers on one hand and environmental users and stakeholders on the other hand have been particularly noted (Gardner & Stern, 1996), but there are other bases for individual differences.

A personal involvement, or place-based identification, with the threatened environment can affect risk perceptions, and not always in the same way. It may increase individual risk sensitivity and the readiness to adopt self-protecting actions, as recently shown in a case of flooding risk (De Dominicis, et al., 2014); alternatively, place identification can increase the tendency to deny this risk. For example, in a study of perceptions of local beach pollution, Bonaiuto et al. (1996) found that residents with higher local identity rejected local designations of beach pollution by a non-local outgroup (the European Union). Risk perceptions and communication are also closely connected to an individual's attitudes towards and acceptance of

environmental policy, and how these are influenced by values and worldviews (Steg, Dreijerink & Abrahamse, 2005; Steg et al., 2014).

In addition to media or climate forecast information, many rely on their own ability to detect changes in environmental conditions that could impact livelihoods (such as farming or fishing). Gradually evolving shifts in environmental conditions, characteristic of global climate change, may be particularly difficult if not impossible to detect (Leach, 2007; Rao, Nidegwa, Kizito, & Ozyoo, 2011). Indigenous knowledge and practices that have historically been a source of resilience within resource dependent communities, in some cases, may become less effective as socio-ecological systems evolve in response to climate change, land use changes, technological developments, and other anthropogenic pressures (Alessa, Kliskey, Williams & Barton, 2008; Bone, Alessa, Altaweel, Kliskey & Lammers, 2011). Psychological research can evaluate approaches for providing information and education about environmental risks (e.g., Bolderdijk, Gorsira, Keizer, & Steg, 2013; Boomsma & Steg, 2014), so as to better understand the factors that influence responses and the social psychological processes influencing risk amplification and attenuation (cf. Kasperson et al., 1988).

Recognizing the Psychological Impacts of Environmental Conditions

As part of a socio-ecological system, humans are not only causal agents of environmental problems but also potential victims, as these problems pose a significant threat to human health and wellbeing. In addition to physical impacts, the effects on mental health are potentially profound. Extreme weather events lead to social and economic disruptions, and these impacts disproportionately affect the poor and vulnerable. Increasing environmental unpredictability is an additional source of stress, particularly for individuals engaged in resource dependent livelihoods. In addition, physical vulnerability will dramatically increase in some locations,

triggering an increase in migration and causing disruptions to familial and social networks (Weissbecker, 2011). Research on the effects of natural disasters such as hurricanes and droughts has shown a range of effects from these environmental catastrophes; probable impacts include stress and anxiety, conflict and violence, social inequity, and threats to traditional cultures and identities (e.g., Adger, Barnett, Brown, Marshall, & O'Brien, 2013; Adger, Barnett, Chapin, & Ellemer, 2011; Cunsolo Willox et al., 2013; Neria & Schultz, 2012; Weissbecker, 2011). There is little research as of yet discussing the impacts of more gradual changes in climate, with some notable exceptions (Anderson, 2012; Hsiang et al., 2013).

Adaptations in the form of infrastructure improvements and livelihood innovations can help to buffer these impacts, and interventions in the aftermath of disasters can help to mitigate the psychological trauma and offer coping strategies to improve resilience (Gheytanchi et al., 2007). The field of psychology has contributed to the development of effective models for rapid responses in the face of disasters, for supporting members of uprooted communities, and for targeting the most vulnerable members of the community (http://apa.org/topics/disasters/). Research has also looked for ways to encourage people to prepare themselves for negative environmental events. De Dominicis et al. (2014), for example, found that residents of flood-prone cities accurately perceived themselves to be at greater risk, but only indicated intention to prepare for that risk when they had received a targeted communication emphasizing how the flooding might affect them personally. As greater numbers of environmental disasters are projected, psychologists will need to develop their contribution to responses to disasters as well as adaptations that will prepare communities for potential disasters. This may require, for instance, consideration of the ways in which global environmental problems are linked to local disasters.

Linking Place-Based Research to Global Environmental Trends

Psychological research on place attachment and place identity has described how people develop important emotional, cognitive and behavioral connections to their everyday life settings, or *places*, such as homes, neighborhoods, cities, and regions (Altman & Low, 1973; Canter, 1977; Manzo & Devine-Wright; 2013). This *place theory* pointed out the multi-dimensional, multi-level and also multi-place nature of individual place experience, with multiple and often nested scales of places involved (Bonnes, Mannetti, Secchiaroli & Tanucci, 1990; Manzo & Devine-Wright, 2013.)

The literature on place attachment and place identity indicates ways that people's relationships to the places that they value, such as homes and neighborhoods, are important to all three of the above topics: environmentally-significant local behaviors, perceptions of changes in the local environment, and psychological impacts of local environmental degradation. For instance, a place identity, or sense of oneself that is tied to a particular place, can influence reactions to policies that influence local community green spaces (Swim, Johnson, Cundiff, & Lord, 2014). A growing number of studies show the relevance of place-based, or locally anchored, psychological processes, such as place attachment and place identity, for various global change-related pro-environmental attitudes and behaviors. Examples include the reduction of water consumption (Bonaiuto et al., 2008), the support of biodiversity conservation policies (Bonaiuto et al., 2002; Carrus et al. 2005), and 'NIMBY' (Not In My Back Yard) responses to proposals to construct renewable energy installations (Devine-Wright, 2009; Devine-Wright & Howes, 2010). Place-based processes have been recently pointed out as affecting other environmentally-relevant orientations and behaviors. For example, people show comparative optimism in their assessment of local as compared to global environmental conditions (Gifford et

al. 2009). Local norms affecting specific pro-environmental choices, such as home waste recycling (Fornara et al., 2011) or towel reuse by hotel guests (Goldstein et al., 2008) are also specific to clearly defined locations.

Some forms of environmental change can disrupt place identity, in turn decreasing psychological wellbeing (Brown & Perkins, 1992; Fullilove, 2013). The emotional and symbolic aspects of daily life in specific environments are often downplayed in relation to economic or engineering responses to environmental changes such as, for example, weather events, flooding, or coastal erosion (Agyeman, Devine-Wright, & Prange, 2009; De Dominicis et al., 2014). Psychologists can communicate with policy makers and other environmental decision makers (designers, engineers, managers, etc.) regarding the impacts of place changes upon psychological wellbeing and other relevant psychological processes (environmental identities, attitudes, intentions, etc.). Place identification-associated processes can and should be drawn upon to better understand individual responses to global and local environmental changes (Adger et al., 2011; Devine-Wright, 2013).

A Research Agenda for Psychologists

While acknowledging the work that has already been done, as briefly reviewed above, we also see important areas that remain relatively unexplored. In this section, we outline some priority avenues for research. See Table 1 for general recommendations as well as examples of specific research questions.

Insert Table 1 about here

I. Incorporate Context Into Research on Pro-Environmental Behavior

(a) *Understanding and modeling contextual influences of environmental behavior.*

The subdiscipline of environmental psychology is founded on a transactional perspective whereby behavior is understood to be a function of the interactions between person and environment (B=f(P, E); Lewin, 1943). Yet it remains a challenge for the discipline as a whole to adequately account for environmental factors (meaning, here, social and particularly physical context) in its models of behavior and behavior change. While progress has been made in recent decades, particularly in understanding the impact of social context (e.g., Stern, 2000b; Steg et al., 2014; Swim & Becker, 2013), the focus remains primarily on 'internal', individual-level variables (e.g., beliefs, values, identities, attitudes; Gifford, 2014; Steg & Vlek, 2009) that account for relatively little variance in many pro-environmental behaviors (e.g., Black et al., 1985). Contextual factors, ranging from culture to aspects of the immediate built environment, can have important influences on environmental behavior, and can hence be an important target for programs and initiatives designed to encourage pro-environmental behavior. Also, contextual factors can interact with individual factors, influencing the extent and the way the latter affect choices and behavior (Steg et al., 2014). As we discuss below, this highlights a critical need for greater collaborative working between psychologists and other disciplines – particularly those involved in the design of technologies and built environments - to understand and model the diverse influences on behavior. Stokols and colleagues made a similar call in 2009, arguing for increased research on the way in which people make the connection between local environments and global events (Stokols, Misra, Runnerstrom, & Hipp, 2009). This remains an important area for research focus.

(b) *Researching behavior in non-Western contexts*.

Much psychological research relies predominantly on convenience (student) samples to understand behavior and its theories are largely developed on a very specific, and

unrepresentative, type of human societies (from Western, Educated, Industrialized, Rich, and Democratic [WEIRD] societies; Henrich et al., 2010). Psychologists working on the global problem of environmental degradation and change, similarly, have yet to move much beyond Western contexts to examine perceptual and behavioral engagement with a variety of environments (Steg et al., 2014). Understanding non-Western culture and behavior requires insights from researchers from those cultures. Cross-cultural collaborations are a clear priority for a discipline founded on a transactional perspective, and initial work in this area highlights their value and challenges (Corral-Verdugo, 1997; Gifford et al., 2009; Schultz & Zelezny, 1999).

II. Consider the Practical Impacts of Research

(c) *Understanding and modeling dynamics and conditions for durable change***.**

Much is already known about how to change behavior (e.g., Abrahamse & Steg, 2013; Abrahamse et al., 2005; Gardner & Stern, 1996), but evaluations of real-world interventions rarely adopt rigorous methodologies (e.g., randomized controlled trials) or assess behavior change over the long-term (e.g., Graham-Rowe et al, 2011); many still do not use objective outcome measures (e.g., kWh, waste weight; Abrahamse et al., 2005; Whitmarsh et al., 2010); and the time-frame for analysis is typically brief. Studies tend to examine the immediate effects of interventions on behavior, but relatively few have provided follow-ups beyond a couple of weeks (e.g., Abrahamse & Steg, 2013; Staats et al., 2004). Consequently, understanding how to foster durable behavior change and embed new habits, while not a new topic, is relatively under-explored (Verplanken et al. 1997; Bamberg, 2006).

In addition, research has focused more on static behavioral models rather than on dynamic or process models of change. While such models exist in psychology (e.g., Bamberg,

2013), they have received more attention in health and other areas, compared to the natural environment context. Many studies examine behaviors in isolation from other behaviors, implicitly assuming that one type of behavioral change is independent of other behavior changes. In terms of process, many psychological models assume a linear, sometimes singular, progression where an outside force causes internal changes, which then leads to behavioral outcomes. However, change processes include double loop learning where feedback loops do not just self-regulate actions but also potentially influence higher order goals or values that provide the psychological context for actions (Argyris & Schon, 1996; Shove, 2010). Higher-order changes could involve tipping points where a certain number of behavioral changes or a certain interval of time radically alters self-perception, for example from a concerned citizen to an activist. Our actions can also alter social contexts when pro-environmental actions or stances prompt supportive or unsupportive responses from friends and family.

An urgent priority remains to embed evaluation within behavior change interventions and policies. Such evaluation studies should not only examine whether interventions were successful in changing behavior, but also study why interventions were successful or not, so as to better understand the processes through which behavior changes take place (cf. Abrahamse & Steg, 2013). The evaluations need to consider ways to upscale successful examples in order to facilitate a move from demonstration projects to larger scale deployment. This will not only advance theory, but also practice as it may yield important insights in how to improve interventions to optimize effects.

(*d) Focusing on environmentally significant behaviors, including public-sphere action*.

This suggestion came from the earlier taskforce, but it bears repeating. Psychologists have been criticized (Shove, 2010) for focusing on behaviors that are easy to change but which

have relatively little environmental impact (Gardner & Stern, 1996; Poortinga & Steg, 2002). More impactful behaviors with respect to climate change mitigation include energy and travel curtailment and adopting low-carbon diets (e.g., Gardner & Stern, 2009; Abrahamse et al., 2007). Some of these behaviors are deeply culturally and structurally entrenched, which makes them difficult to change (Butler et al., 2012). It is also key to consider public-sphere (i.e., socio-political) actions, such as policy support, lobbying, voting, and engaging in community action to instigate or support change at the wider, structural level (e.g., Steg et al., 2005; Schuitema et al., 2010).

(e) Fostering public engagement with environmental issues.

As new environmental and sustainability issues are exposed (often by scientists) and emerge into public consciousness, it is important to understand how these are constructed and communicated through the mass media (Castro, Mouro, & Gouveia, 2012) and social networks (Pidgeon et al., 2003), and how decision-makers might take account of diverse perspectives in considering societal responses (technologies, policies, etc.). Participatory methods and novel communication tools, including social media (Dietz & Stern, 2008), need to be developed and tested with different groups, including those who are hard-to-reach and feel disempowered to address these issues. Individual values (e.g., Boomsma & Steg, 2014; Bolderdijk et al., 2013; Steg et al., 2014), as well as locally-based psychological processes such as place identification or attachment (de Dominicis et al., 2014), may play an important role in this respect.

III. Integrate Human Wellbeing and Environmental Sustainability

(f) *Defining and measuring ecosystem services.*

Ecologists define ecosystem services as the parts of our natural ecological systems that provide benefit to people, such as provision of food and water purification (Millennium

Ecosystem Assessment, 2005). To date, research on ecosystem services has tended to apply an economic lens (UKNEA, 2011), with little attention to psychological benefits, though cultural services are increasingly acknowledged (Paracchini et al., 2014). Yet the important psychological functions provided by natural environments, including restoration and recovery, are well established (e.g., Ulrich, 1983; Kaplan, 1995). Research suggests additional psychological benefits, including the potential role of the environment in fulfilling individual identity needs (Clayton, 2012; Wallen, 2013). Because ecosystem service assessments can be used to calculate the costs and benefits of environmental policies and programs, psychological research is important in order to explore and measure the full range of services that natural environments may provide.

(g) *Exploring the interdependence of environmental and social wellbeing.*

We know that environmental and human health are intricately intertwined. This area of research is likely to become increasingly important as people spend increasing amounts of time in urban environments (Gifford, 2014) and potentially lose out on the restorative opportunities presented by time in nature. At the same time, environmental risks, such as climate change or air pollution, threaten ecosystems as well as human societies directly. It has been argued that psychological restoration in nature can encourage pro-environmental and pro-social behavior (Hartig et al., 2001; Zhang et al., 2014); thus protecting these environments would seem to have multiple sustainability-related outcomes. This area of research is particularly fertile ground for positive psychologists, suggesting that the environment and proenvironmental behavior provide both sources of happiness, and resources for resilience (Clayton & Myers, 2015, chapter 12; Venhoeven et al., 2013).

Several issues with implications for social justice emerge when considering the interdependence between environmental and social wellbeing. First, there are concerns about the disadvantaged, who are most vulnerable to environmental problems and have the least resources to cope with the problems (Doherty & Clayton, 2011; Reser & Swim, 2011). Second, much of our research on environmental significant behaviors has focused on ways to minimize harm to the environment. However, there is a growing need to examine how individuals and communities can best adapt to changing environmental conditions. This type of work requires a long-term perspective, engagement with communities, and interdisciplinary efforts.

Integrating Psychology with Other Disciplines

Because of the complexity of environmental issues, psychologists will need to work closely with other disciplines and non-academic stakeholders (Schoot Uiterkamp & Vlek, 2007). The American Psychological Association has recognized the need for psychology to be more involved in interdisciplinary research (Johnson, 2012); as a "hub" science (Cacioppo, 2007) it is particularly suited to making the connections among multiple disciplines. In order to take on the present environmental challenge, psychologists need to improve their ability to work according to different models. This suggests not only continuing a monodisciplinary approach, focused on developing constructs and theories specific to a disciplinary domain and oriented towards intra-disciplinary relevance, but expanding to encompass a multidisciplinary approach – when different disciplines work in parallel and emphasize mutual communication and understanding – and to include more interdisciplinary approaches, which emphasize further integration. The challenges of interdisciplinary work should not be underestimated (Whitmarsh et al., 2011), but there are many examples of successful projects involving psychologists and other social, natural and engineering sciences, as well as non-academic practitioners that can be seen as models for

future work (e.g., Abrahamse et al., 2007; Bonnes, 1984; Bonnes et al., 2004; Schoot Uiterkamp & Vlek, 2007).

The successful integration of multiple disciplines to address environmental problems requires both humility and the willingness to critically reflect on the strengths and the limitations of what a psychological contribution can achieve. In interdisciplinary scholarship, all contributors need to be open to novel perspectives, to respect different points of view even if based on divergent epistemological or methodological approaches, and to work hard to integrate them. This can be complicated by differences in jargon (e.g. using different concepts for the same construct or using similar labels for different constructs) and by resistance to criticism of basic assumptions that have come to be perceived as facts in one's own field. It also requires a consideration of trust – how to ensure that all team members are acting ethically and competently when each member does not have expertise in the other disciplines (Stanley, 2014).

While actually conducting research, the integration of psychology with other disciplines is aided by constructing conceptual frameworks for human-environment interactions that integrate multiple disciplines into wider explanatory accounts. For psychologists this often requires going beyond a focus upon intrapsychic constructs such as beliefs, attitudes or values, to examining how the constructs relate to broader structural and societal processes at multiple spatial scales including legal regulations, economic incentives and material infrastructures. This is not to diminish the importance of an individual level analysis, but psychologists should recognize the individual as an agent that is nested within a socio-ecological system (Ostrom, 2009; Oishi & Graham, 2010). This also helps to identify explicit 'points of entry' where psychology can play a useful and even crucial role. In parallel, other disciplines should also be willing to question their (often erroneous) assumptions about human preferences and behavior.

Allied to this is the need to develop methods that are able to triangulate multiple research designs and forms of data (objective and subjective, qualitative and quantitative, measurements and simulations). This is a valuable approach in any case, as it can cross-validate findings, whereby weaknesses of one design can be compensated by strengths of another design.

One example of this is the way in which we seek to understand energy use in the home. A conventional intra-disciplinary approach for psychology might seek to measure specific cognitions that might inform why individuals choose to enact some energy saving methods and not others. However, this approach says little about spatial variation, the impact of rising energy prices or the impact of novel technical systems. A contrasting approach might begin with a framing of the research questions in terms of investigating the factors shaping household energy consumption (see Stern, 2014), which acknowledges the multiple disciplinary approaches that could usefully inform understanding of this problem. For example, in the interdisciplinary project reported by Abrahamse et al. (2007), environmental scientists assessed the environmental impact (i.e., energy use) of different types of behaviors. This information enabled the research team to provide participating households with specific tips on how to reduce their energy use (e.g., by turning your thermostat down 1 degree, you would save XX% of energy), tailored to the specific household (that is, households only received tips that were relevant to their situation and that would enable them to realize substantial savings), and to provide them with feedback on how much energy they saved by changing particular behaviors (e.g., members of your household took shorter showers, which saved XX% energy). In addition, computer scientists developed a web-based tool to deliver the tailored information and feedback to households, on the basis of the input of the psychologists and environmental scientists. This resulted in a cost-effective tool to deliver tailored information to a large group of households.

A number of recent papers and reports have discussed ways in which to encourage interdisciplinary collaborations on environmental topics (Hackmann, Moses, & St. Clair, 2014; Sovacool, 2013; Vincent, Santos, & Cabral, 2014). We describe some of these in Table 2.

Insert Table 2 about here

The value of interdisciplinary research can and should be inculcated into the education and training of psychologists from the very start. Students of psychology should be informed not only about what their own discipline can offer, but also how this fits into a bigger picture of other disciplines' contributions towards addressing grand environmental problems. Many universities offer multi- and interdisciplinary courses as standard within undergraduate programs. Others offer post-graduate Master's degree programs that seek to integrate disciplinary approaches. Beyond degree programs, professional organizations such as the British Psychological Society or APA could offer or endorse training courses in multidisciplinary working for psychologists, recognized as continuous professional development. It is important to recognize that crossing disciplinary boundaries by participating in multidisciplinary teams can be a risky business as long as this activity is given less academic and institutional value than mono-disciplinary research. Often this comes down to how funding opportunities are structured.

Under certain programs, contributions by teams of multiple disciplines are obligatory, thus giving an incentive to work collectively and collaboratively. But successful multidisciplinary teams may take years to get going, providing sufficient time for each contributor to learn about others' perspectives and to forge a common understanding or language to investigate that specific issue or problem in that context. Research proposals of this kind also require a different kind of evaluation process that obliges peer reviewers to go beyond the conventions of their own discipline and to recognize the value of a broader emphasis. Like other

academics, psychologists are most incentivized to publish in a relatively narrow set of disciplinary journals to secure positions, promotions, and tenure within the field. There now exist several high impact, multidisciplinary journals that focus on environmental problems and that are open to psychological contributions (e.g. Global Environmental Change; Nature Climate Change; Wiley Interdisciplinary Reviews: Climate Change). However, for psychology to effectively participate in a discussion of how to solve today's grand environmental challenges, departments and senior scholars in the field will need to encourage and reward scholarship that moves beyond traditional publication norms.

Divergent Research Approaches

As a diverse group of scholars drawn from multiple countries, our discussions about this topic revealed important differences in ways of thinking about how psychology should best tackle these important issues, differences that have been largely overlooked to date in similar reviews conducted by US based scholars (Oskamp, 2000; Swim et al, 2011). These distinctions have been touched upon above, but here we summarise the points of view and briefly discuss their implications for future research.

First, there is divergence in the *view of the person* implicit in psychological understandings. The conventional approach presumes that psychological processes (e.g. values, beliefs, norms and attitudes) can be abstracted from their specific context and that research findings can be generalized across contexts or situations. Psychological research informed by this approach is *decontextualized:* the specific location where the person that is the object of inquiry is situated is typically not a focus of research, hence the reliance upon methods such as laboratory experiments and questionnaires. Moreover, when the 'environment' is the object of research it is typically an abstract or 'global' one, not a specific location, as reflected by

constructs and literatures on environmental concern, environmental worldviews, environmental identity etc. An alternative, *contextualized* approach takes a fundamentally different starting point - a conception of the *person in a place.* This approach is illustrated by constructs such as behavior setting (Barker, 1968), place (Canter, 1977) and affordance (Gibson, 1979) that emphasize the transactions between persons and their social/psychical/ecological settings over time. From this perspective, intra-psychic processes are still important, but considered to be inseparable from the physical/material environmental context in which they take place.

In fact, the traditional distinction between global and local that the ecological sciences point out when considering environmental problems parallels the psychological perspective on these problems. For example some contextualized psychological processes, more dependent on the immediate perceptually relevant environment, could be considered locally oriented, or 'place-based.' In comparison, more globally oriented processes place an issue within psychologically significant frameworks that are decontextualized and trans-situational, such as personal values and world views, normative-ethical principles, or superordinate goals. A psychology of environmental changes should pay special attention to place-based psychological processes, in addition to the more trans-situational ones generally considered, in order to better understand the linkages between these two ecological dimensions at the psychological level (Bonnes & Bonaiuto, 2002; Devine-Wright, 2013; Bonnes et al., 2014). This accords with the early imperative of political ecology: "think globally and act locally" (Di Castri et al 1982, Ostrom, 2009; Oishi & Graham, 2010).

Both contextualized and decontextualized approaches are important. However, the reality is that research informed by the *person-in-place* perspective has become less prevalent. Introductory psychology textbooks are less likely to emphasize environmental psychological

research today than they were in the 1980s (Oishi & Graham, 2010). As a result, there is a strong possibility that an emerging generation of young psychologists is comparatively ignorant of the perspectives, constructs and methods that were devised by early environmental psychologists to study 'the person in a place' and that remain relevant today. If a lack of engagement with the physical environment is a significant factor underlying the environmental crisis, then a decontextualized approach to psychological research may ultimately perpetuate this dynamic. How feasible is it that a discipline that begins with a conceptualization of the person in which the environment is exogenous can hope to make a lasting contribution to solving environmental problems?

A second divergence concerns research whose primary goals are respectively to develop psychological knowledge or to address real-world environmental problems. As suggested in Table 1, this divergence also has implications for the structure of multidisciplinary collaborations. A conventional theory-based approach starts with existing psychological theories and constructs, and seeks to apply them to environmental problems. It is presumed that through this approach, psychology as a discipline will develop valuable knowledge for addressing environmental problems; in consequence, the discipline needs to ensure that other disciplines and policy makers become better aware of this body of knowledge, so as to realize its value. An alternative approach calls on psychologists to contribute to trans-disciplinary efforts that are problem focused. The primary goal is not to promote psychology *per se* or to achieve a better understanding of specific psychological constructs, but to join an interdisciplinary effort to develop knowledge that can be applied to an important phenomenon of human-environment interaction. Such projects can also make valuable contributions to psychological theory, but that is not the primary instigator.

The De Dominicis et al. (2014) study, described above, exemplifies the multiple directions that psychologists might follow in approaching a specific environmental problem. In that case, psychologists were asked by local public environmental authorities to collaborate with their various technicians, scientists and experts to help in designing better intervention strategies for improving residents' coping behaviors and safety choices, in view of possible flooding events. Psychologists worked from an interdisciplinary/transdisciplinary perspective, on the one hand, by collaborating with the above-indicated experts (through interviews, documents consultation, expert meetings, etc.) concerning the best available practices for residents to use in case of flooding; and along a more intra-disciplinary perspective, on the other hand, through field research inquiring into the perceptions, habits, and behavioral intentions of residents living in areas with different degrees of flooding risk. The psychologists then had to integrate the psychological data with the information from the other environmental experts/ scientists as well as analyzing and testing them in relation to specific relevant psychological theories. Through these research results, psychologists were able to indicate to the external experts the preferred ways to communicate this environmental risk in order to improve residents' coping behaviors, as well as to further demonstrate the validity of the theory, both in the general sense and also for the domain of environmental risk communication.

We recognize the value of both theory-based and problem-based approaches and believe they can and should be integrated; however, they have not had equal status and prevalence. Given that the theory-based approach has been predominant, we believe that psychology can best enhance its contributions to solving environmental problems by conducting more research that adopts a contextualized approach to the person, begins with issues or environmental problems, and engages with these in a trans-disciplinary context.

Benefits to the Field of Psychology

Environmental problems, while daunting, also present us with the opportunity to advance the goals of psychology. For example, a central goal is to understand human behavior, considering the individual, social, physical, and cultural factors that influence it. However, the significance of contextual factors has often been overlooked by psychologists who have relied on homogenous research environments, particularly lab-based research, and as a result, psychological research has been criticized for a lack of ecological validity (Levitt & List, 2007; Sears, 1986). Attending to the effects of specific socio-physical contextual factors and human responses to contextual changes, as suggested in the previous section, will improve the ability of psychologists to understand behavior within more naturalistic settings, and to understand how psychological and contextual factors interact in influencing perceptions and behavior. The massive environmental changes we currently face provide an important opportunity for psychological research to investigate environmental influences, to test theories in specific contexts, to develop new theories and to impact on decision-making.

A second goal of psychology has been to promote human wellbeing, both as mental health practitioners and as applied psychologists concerned about societal problems. Increasingly, those concerned with individual health topics like depression, obesity, or violence have recognized that these outcomes respond not only to the immediate social context, like the family, but also to local and global environmental contexts, like walkable neighborhoods, societal cues about eating, or warmer temperatures (e.g., Brownell & Horgen, 2004; Hsiang et al., 2013). Similarly, promoting healthy behavior change is more likely when that change can be institutionalized through social policies and procedures that take these contextual factors into account (Brown & Werner, 2012). Achieving the benefits to individual wellbeing that may

result from increased exercise or exposure to green spaces will require urban design and social policies to support these activities. Psychologists can work with designers and planners, as well as decision- and policy makers, to enable environmental management and policy change that is informed by evidence from psychological research.

By broadening their attention to environmental problems and solutions, psychologists have the potential to make a unique contribution towards some of the world's most pressing environmental and human rights challenges (cf. Clay, 2014). Work in this area also presents an avenue for psychological researchers to develop collaborations with other disciplines, which will prompt further theory development and the effective application of psychological knowledge (Stern, 2000a). There are increasing signs that funding institutions and policy makers want researchers to explain why their research is important for society and to consider potential applications of the results, while also valuing problem-focused, trans-disciplinary research to address environmental problems. We believe that identifying other disciplines with shared interests and pursuing cross-disciplinary projects will allow psychologists to pursue their research and other professional activities more effectively.

Conclusion

Environmental problems demand the attention of psychologists, due to both their pressing nature and also their relevance to human capabilities and wellbeing. Despite a number of previous "calls to action" (e.g., Kazdin, 2009, Oskamp, 2000), we believe that psychology and psychologists could do much more to address these problems. We hope that our description of past research and articulation of an agenda for the future will inspire our colleagues – particularly those at an early career stage – to follow through on these calls to action. Critically, a full realization of psychology's potential to confront environmental challenges will require that

psychologists learn from past approaches to apply a range of constructs and methods, and that psychologists across subdisciplines work together to embrace interdisciplinarity in research and training. These are significant challenges to current disciplinary norms, yet by addressing them psychology and psychologists can play a more influential role in solving the pressing environmental problems that we face.

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Table 1

Recommendations for future directions: Sample research questions

Problem-focus	**Theory-focus**
Incorporate context into research on pro-environmental behavior	
Compare the effectiveness of specific environmental policies in different countries [Work with political scientists to understand the multi-level (local to trans-national) political context]	Model the influence of nested household, neighborhood, and country-level influences on policy acceptance
Consider the practical impacts of research	
Utilize multiple means of communicating about environmental risk (and assess their impact) [Obtain information from other scientists about important local risks and their effects]	Examine predictors of long-term behavior change, including tipping points for social influence to become normative
Integrate human well-being and environmental sustainability	
Describe how people will be affected by specific environmental changes, e.g. living near a toxic waste dump or a renewable energy project [Obtain information from other scientists about the environmental impacts of these changes.]	Develop a way to define and assess psychological aspects of ecosystem services

Table 2

Recommendations to enhance interdisciplinary and multidisciplinary collaboration

- **Individuals**
  - Admit ignorance in areas outside one's specialty
  - Recognise limitations to the contribution of any single discipline
  - Learn some of the vocabulary of other disciplines
  - Make the effort to locate people from other disciplines working on similar topics
- **Research practices**
  - Incorporate time for regular face-to-face contact with research teams
  - Construct a shared framework of concepts and processes relevant to the problem being examined
  - Consider ways to disseminate information across disciplinary boundaries, e.g. in multidisciplinary journals and databases
- **Institutions (universities, professional societies, funding organizations)**
  - Incorporate multidisciplinarity into training (courses, professional workshops)
  - Fund and support multidisciplinary research teams
  - Develop appropriate mechanisms for reviewing and evaluating multidisciplinary projects (for funding and for promotion and tenure)

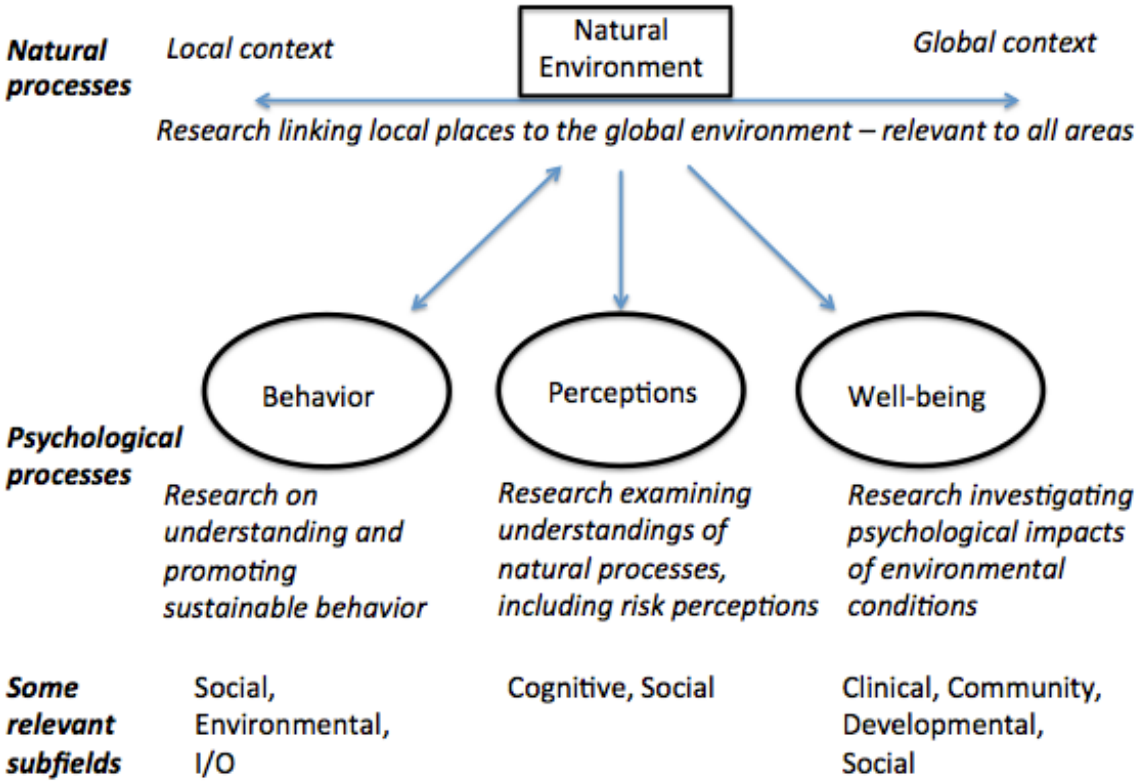

Figure 1: Major areas of research on human-environment relations