RESPONDING TO CLIMATE CHANGE
The Need for an Integral Approach

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Climate change is now recognized as one of the most challenging and complex problems facing humanity—the problem is real, the stakes are high, and there is no single "solution." No measure will be met with the instant gratification that is often expected by people in modern, high-energy consumption societies. We are already committed to changes based on past emissions of greenhouse gases into the atmosphere, and it is the future that is being decided (Parry et al., 2008a). Actions taken over the next decade will have an enormous influence on the rate and magnitude of climate change that will take place over the next centuries, and both adaptation and mitigation are seen as necessary responses (Parry et al. 2008b; Schellnhuber, 2008).

The consequences of increasing temperatures, changing precipitation patterns, and a rise in sea level will affect all aspects of the Earth system, from phytoplankton in the sea to mountain glaciers in the Himalayas (IPCC 2007a, 2007b). Social-ecological systems will undergo transformations that test their resilience, and many species are expected to disappear as the result of changes to habitats and food supplies (Steffen et al., 2004). Ecosystem services will be altered, i.e., the provisioning of food and water, the regulation and control of disease, and pollination processes, to name a few (MA, 2006). The challenges faced by humans at the turn of the 21st century—poverty, disease, conflict, environmental degradation, and so on—may be exacerbated by climate change. In short, the implications of climate change are serious. Climate change can be considered as the biggest environmental threat in human history, and as the defining human development challenge for the 21st century (IPCC, 2007b; UNDP, 2007; Stern, 2007).

Yet climate change is not simply an environmental problem that can be addressed by regulating greenhouse gas emissions. It is about human development, social justice, equity, and human rights (Adger et al., 2006). It is about human security and the capacity of individuals and communities to respond to threats to their social, environmental, and human rights (Barnett et al., 2008). As the United Nations Development Programme puts it, "It is about people developing the capabilities that empower them to make choices and to lead lives that they value" (UNDP, 2007, p. 7). Climate change is closely related to how humans perceive themselves in the world and how they confront change. In fact, although it is certainly about the climate, at another level it is about how humans both create and respond to change.

In this article I discuss why an integral approach is not only necessary for addressing climate change, but urgent. I argue that an emphasis on understanding climate change from a an objective, systems perspective has downplayed the importance of subjective, interior dimensions of climate change, when in fact the integration of both aspects is needed. I then present six reasons why an integral approach can be considered both useful and necessary for responding to climate change. Finally, I consider what integral theory might offer to current policy debates about one of the world's climate change "hot spots"—the Arctic region.

An Objective View of Climate Change

Most of the scientific research on climate change that has been presented in the four assessment reports of the Intergovernmental Panel on Climate Change (IPCC) has been carried out from a systems perspective. This research has contributed to a better understanding of complex, interacting systems, including the identification of important interactions and feedbacks. Earth-systems science in general has shown how changes in biogeochemical cycles, land cover changes, and other human activities have influenced the global climate, including hydrological systems (Steffen et al., 2004). General circulation models of atmosphere-ocean-land-ice interactions have been used as a basis for assessing the physical and social impacts of climate change, and vulnerability approaches have provided insights on the underlying social, economic, political, and environmental contexts that contribute to negative outcomes. Integrated assessment models link knowledge from diverse disciplines and scales of analysis into a single framework, highlighting the connections and policy implications (Bouwman et al., 2006). Agent-based modeling simulates the actions and interactions of autonomous individuals, showing how they influence the system as a whole (Ziervogel et al., 2005). Research on coupled social-ecological systems shows that humans are having a profound effect on the planet, and there are increased calls for "resilience thinking" (Walker & Salt, 2007). Together, these approaches have contributed to the emergence of sustainability science, which represents a new paradigm in scientific inquiry based around a normative call "to map the broad, inclusive, and contradictory currents that humankind will need to navigate toward a just and sustainable future" (Kates & Parriss, 2003, p. 8067).

Although many useful frameworks, methodologies, and approaches have been developed to address the complexity of the Earth system, it is widely recognized that responses to climate change will require not only institutional changes, but also changes in human behavior. Studies of human behavior in relation to environmental change have generated new insights on how human actions do or do not occur (Stern, 2000; Grothmann & Patt, 2005).This research has provided a foundation for identifying both policy and practical responses to climate change. Although the contributions of these methodologies and approaches are impressive, the more that research on climate change progresses, the more it becomes clear that there is more to the climate change problem that must be included in analyses of the causes, consequences, and behavioral responses—including dimensions that cannot be adequately captured in objective, "systems" thinking. Some of this has been mentioned in postmodern critiques of climate change research that draw from social constructivism, critical realism, and other social theories to understand how and why climate change is a problem (Castree & Braun, 2001; Forsyth, 2003). For example, David Demeritt (2001) builds on some of the critiques of the reductionist formulation of climate change and argues in favor of a more reflexive understanding of science as a social practice. Similarly, Mike Hulme (Dessai et al., 2007) argues that culture and climate are intimately related, and that the contemporary discourse of climatic catastrophe can only be dissolved through cultural change.

In spite of these critiques, the models and frameworks most often used by the scientific community do not incorporate the subjective and interior "human" dimensions of climate change. When included, the interior aspects of humans are flattened out and simplified, ignoring the depth of human experiences and development. Human motivations and the various lines of psychological development in individuals have most often been disregarded, and the role of culture, values, and worldviews is only just beginning to receive attention in climate change research.Where interiors have been studied, they

have not been well integrated with research on systems and behavior. As integral theory makes clear, however, all of these aspects *and* their integration are essential to understanding climate change.

Integral Theory and Climate Change

Integral theory offers a framework that takes into account the bigger picture in which climate change is occurring, and thus it can offer insights on the types of responses and strategies that are necessary to confront the challenge—responses that address all quadrants, levels, lines, states, and types (i.e., the AQAL model) (Wilber, 1996; Esbjörn-Hargens & Zimmerman, 2009). Below, I discuss six reasons why integral theory may be both useful and necessary for responding to climate change:

1. *Integral theory recognizes the interior and exterior dimensions of climate change—and of climate change research.* The problem of climate change can be studied from both subjective and objective views, from the perspectives of I, we, and it(s). However, as described above, it has for the most part been studied from an objective perspective, or from within the Right-Hand quadrants. Integral theory draws attention to the role of individual cognition and consciousness, and to the importance of collective values and beliefs as influences on behavior and systems.These subjective, interior dimensions represent an important part of the picture, and they need to be considered in discussions and debates about climate change.

   The research itself on climate change must also take into account both interior and exterior dimensions of the issue. One of the interesting aspects of the climate change problem is that it is very difficult to study from an exclusively objective perspective. It is a problem that scientists are a part of and contribute to, and it is a problem that will affect them, as well as their children and grandchildren, in the future. In other words, scientists have a personal stake in the problem, both as contributors to the problem and to the solution. Climate skeptics often point to a very different stake (i.e., research funding) as driving the interest in climate change. However, many climate change researchers are personally and collectively concerned about the issue, and they are more often driven by interior motivations than the availability of funding.Although many scientists are concerned about the ability of society to respond rapidly and effectively to climate change, at the same time they are asked to continually fly around the world to meetings to discuss the problem. Such contradictions can create an interior dissonance for individuals and groups working on climate change research. Thus, although the science of climate change focuses largely on the exterior aspects of the problem, integral theory recognizes that the interior aspects also matter, not only in relation to the subjects of the research, but also in relation to the researchers themselves.

2. *Integral theory emphasizes that the four quadrants (I, we, it, its) "tetra-arise."* All four quadrants are closely related, and cannot be seen as isolated or independent from each other. The links between the systemic processes associated with climate change are linked to human development: the impacts of climate

change can influence human development, just as human development can influence the future climate system. It is, for example, clear that the impacts of climate change may create additional challenges in meeting the United Nations Millennium Development Goals, particularly if climate variability and extreme events increase (Schipper & Pelling, 2006). Food, water, and shelter are basic human needs and if they are not satisfied, prioritized values and motivations may shift, setting some societies on a backwards trajectory in terms of human development (Inglehart, 1997). Climate change, which is often seen as an abstract and future problem, may not be prioritized in times of economic stagnation and political crisis (Inglehart, 1997).

It is important to recognize that *responses* to climate change may also affect human development. Indeed, one person or group's adaptation to climate change may increase the vulnerability of others; mitigation efforts can likewise influence development trajectories, either positively or negatively. The recent experience with biofuels and its impact on global food availability and access illustrates the complex nature of responses (Runge & Senauer, 2007). Climate change interacts with many other global processes, including trade liberalization and other manifestations of globalization, thus it is difficult to project the exact outcomes of any policy or strategy (Leichenko & O'Brien, 2008). An integral approach captures the way that relationships emerge synchronously and causally in all four quadrants.

3. *Integral theory recognizes stages of human development and "altitudes."* Human beings are diverse, and individuals can be characterized by many different lines of development: cognitive, moral, interpersonal, emotional, psychosexual, kinesthetic, self, values, needs, and so on (Wilber, 2006). Differences in the cognitive line of development alone have significant implications for responses to climate change. Indeed, climate change is a cognitively complex issue: it is a "big picture" problem, and to understand its full implications a worldcentric perspective is required as well as an ability to handle both complexity and paradox. Individuals, groups, and institutions need a well-developed capacity to be self-reflexive, or as Kegan (1982, p. 105) puts it, ". . . to hear, and to seek out, information which might cause the self to alter its behavior, or share in a negative judgment of that behavior." This demands a high level of cognitive development, which may be demanding for many adults, leading to a situation that Kegan (1982) refers to as being "in over our heads" in relation to contemporary global problems.

   The science and policy communities dealing with climate change often do not recognize or respect different stages of development, and instead insist that presenting rational arguments and complex graphics of climate model output should be enough to convince people to change their behavior. Rather than presenting information in an accessible manner that can be understood from diverse perspectives, there is a tendency to reiterate the complexity of the argument. Speaking louder and more often will not, however, persuade most

people in the world that climate change is a real problem. In fact, the psychology literature suggests that people need to have visceral experiences of climate change impacts before it matters to them (Weber, 2006). In other words, people need to subjectively experience and feel the exterior, objective manifestations of climate change. Although scientists debate the extent to which current weather variability and extremes (e.g., hurricanes, floods, droughts) are linked to anthropogenic climate change, many of the observed changes and anomalies in climate conditions around the world may nonetheless be helping to convince many that climate change is an important issue, as much as or perhaps more so than IPCC reports or Al Gore's film, *An Inconvenient Truth*. Rather than waiting until climate change is viscerally experienced or felt by everyone, which may occur after it is too late to prevent dangerous climate change, there are many ways that artists, museum curators, advertisers, and others can creatively present climate change to different audiences. Using an integral approach, climate change can be translated to reach people at different stages of human development.

4. *Integral theory recognizes that values and worldviews are changing.* Human values are important to understanding the impacts and consequences of climate change, and for making the problem real and relevant to diverse groups. Values can also influence prioritized responses to climate change (O'Brien, in press). Yet values are often assumed by researchers to be random or culturally specific, and static. Until recently, more research attention has focused on explaining differences in values than on understanding changes in values (Rokeach, 1979). Recognizing that climate change will mean different things to different individuals, communities, groups, or cultures is essential to providing ownership of the problem, which can be considered a prerequisite for responding to climate change. It is, however, also important to recognize that values change as humans develop, both as individuals and through generations. There is a growing body of research that shows that values are structured in a coherent way and that they change over time as individuals and societies undergo processes of development (Schwartz, 1994; Inglehart, 1997). The future values of today's children and young adults—some of whom are likely to develop "post" postmodern worldviews—need to be taken into account in contemporary responses to climate change. Likewise, the values of future generations must be considered, and this includes the possibility that integral and holistic worldviews may be dominant. Integral theory draws attention to the possibility that climate change may occur in the face of new values associated with integral stages of human development and beyond, and this has implications for the types of responses that are prioritized.

5. *Integral theory recognizes a diversity of needs and motivations, and hence responses*. There is no single solution to climate change, and it is unlikely that a single solution will be found. New technologies and innovations (e.g., efficient carbon capture and storage, harvesting solar power from space, geo-engineering) may take years to develop, and they may create new risks and problems

(Jamieson, 1996). What is needed is not a "magic bullet," but a multitude of measures that transform energy systems, social systems, economic systems, and institutions at an unprecedented rate and scale. The most important solutions to climate change already exist. While there is still a need to focus research and development on, for example, plant-breeding and improved renewable energy technologies, there are a tremendous number of changes that can be enacted immediately, and which may have positive social effects regardless of climate change. However, it is important to target these different responses to the existing diversity of beliefs, values, and worldviews.

A global consensus on climate change is unlikely to occur until after the effects become clearly visible, when thresholds or "tipping points" may have already been reached (Lenton et al., 2008). Yet many of the actions and responses needed to avoid dangerous climate change make good sense for other motivations, and thus can appeal to people with diverse and often conflicting perspectives. For example, the vision plan for the city of San Buenaventura in California draws attention to the urgent actions needed to prevent a *peak oil* crisis, but it focuses on improving the quality of life and leaving future generations with a healthy planet (Chen et al., 2007). Although the driving force behind the visionary plan is not concern about climate change, the plan supports many of the objectives of climate change mitigation and sustainable development. Integral theory provides a map for understanding the diverse contexts and worldviews from which climate change responses can be initiated.

6. *Integral theory encourages integral methodological pluralism*. Interdisciplinary research is considered essential to understanding coupled social-ecological systems and the implications of climate change for humanity. Yet interdisciplinary research has proven to be very difficult, particularly when research is based on differing conceptual or mental models (Newell et al., 2005). Although it is easy for scientists from diverse disciplines to collaborate when they share the same conceptual framework, such as a systems perspective, it becomes much harder when researchers hold different models of reality (e.g., social constructivism vs. neo-classical economics). Yet it is becoming increasingly clear that fragmented research, as well as interdisciplinary research that is limited to one particular paradigm, based on one worldview, or limited to one way of knowing, is likely to be insufficient to meet the challenges of climate change. Without a common framework, it is difficult for scholars from different disciplines to see how diverse fields, approaches, and methodologies relate and fit together. Integral theory provides a framework for understanding climate change that accommodates methodological pluralism and can facilitate interdisciplinary research based on multiple perspectives.

To respond to climate change successfully and avoid disastrous outcomes for humanity requires both a map and a vision. Integral theory offers such a map, and insights from the literature and debates on sustainable development, human development, and human security can contribute to a vision for a positive future under climate change. Nonetheless, some questions remain. How, in practice, might an

integral approach improve knowledge and understandings about responses to climate change? How can integral theory inform adaptation and mitigation strategies and policies? Unfortunately, there are not many examples of climate change research that is informed by integral theory. One exception is Christopher Riedy's research on the implications of integral theory for sustainable development and climate change responses in Australia (Riedy, 2005). He presents an integral policy response to climate change that combines participatory integrated assessment, normative futures work, and other measures and strategies that emphasize both subjective and objective dimensions of sustainable development. Aside from this study and several projects in progress, there seem to be very few examples of research on climate change that are informed by integral theory.

Nonetheless, there are numerous areas, locations, and cases where integral theory can make valuable contributions to understanding or identifying appropriate responses to climate change. In particular, there is one "hot spot" where an integral approach should be prioritized and tested—the Arctic region. The Arctic is undergoing dramatic changes, including the rapid melting of sea ice as the result of climate change, and it is a region where different geopolitical interests—particularly interests in oil, gas, and mineral resources—converge to create a number of obstacles to responding to climate change (Borgerson, 2008). Below, I describe this case and pose some questions that might be addressed and answered through an integral approach.

The Arctic: An Integral Hot Spot

Climate change is currently most visible in the Arctic (ACIA, 2004). The obstacles to responding to climate change in a sustainable and equitable manner are great in this region, and the stakes are high. Different interests, combined with different economic and military capacities, have drawn attention to the role of the Arctic in international security debates (Solana, 2008). Biodiversity protection, the rights of indigenous populations, exploitation of fisheries, expansion of tourism, and opportunities for economic development, military superiority, and oil, gas, and mineral exploitation all form parts of different discourses on the future of the Arctic (Kristiansen, 2008). Indeed, multiple stressors interact in the Arctic, including the accumulation of heavy metals and persistent organic pollutants in species at the top of the food chain as well as the impacts of growing transport, trade, and tourism (ACIA, 2004; Leichenko & O'Brien, 2008).

The melting of sea ice will enhance transport and trade throughout the region, including through the northern sea route (NSR), which is a collection of sailing lanes north of Russia, extending from Novaya Zemlya in the west to the Bering Strait in the east (Leichenko & O'Brien, 2008). The NSR includes the main part of the stretch known as the Northeast Passage, which connects the Atlantic and Pacific Oceans along the northern coast of Asia. The NSR represents a considerably shorter trade route connecting Europe and northeast Asia, and could potentially capture some of the shipping trade currently routed through the Suez and Panama canals. To date, the most significant limitation to the development of the NSR has been ice coverage, as well as political, financial, and institutional factors (Leichenko & O'Brien, 2008).

Reduced sea ice, combined with the expansion of transport routes in the Arctic, may lead not only to increased international trade, but also to increased fossil fuel extraction and an increase in global greenhouse gas emissions (Leichenko & O'Brien, 2008). An estimated 20% of the world's oil and gas resources are located in the Arctic—an estimate that has not escaped nations with Arctic land claims

and multinational oil companies. The oil and gas resources located in the more accessible western regions of the Barents and Kara seas are already being explored and exploited, and a future without sea ice offers new opportunities for profit. Yet an increased extraction and consumption of Arctic oil and gas are expected to substantially increase global carbon dioxide emissions, which is likely to accelerate climate change.

The different interests in the Arctic are likely to create new opportunities for some, but at a large cost. As Robin Leichenko and I note (2008, p. 101), "The vision of a warmer Arctic, bustling with economic activity, represents paradise for some but catastrophe for others. Indeed, the pursuit of new opportunities in the Arctic strongly aligns with the interests and values of some individuals or groups, yet creates friction with those of others." Although there appears to be a clear pattern of winners and losers related to these changes, the pattern can be expected to be ephemeral as sea level rises and changing temperature and rainfall patterns influence coastal areas and ports: "Those with economic interests in the north who are rejoicing at the possibility of an open Arctic and the trade opportunities that it creates may fail to recognize that sea level rise and changing weather patterns represent a dire threat to many of the consumers and trading partners that these countries envision" (Leichenko & O'Brien, 2008, p. 102). In the long run, there will be no winners with climate change, and scientific studies of Arctic ice melt show that the long run is getting closer and closer.

Why is an integral approach needed in the Arctic? First and foremost, because powerful economic interests are intent on extracting and exploiting the enormous wealth of the Arctic region—climate change will facilitate this, yet will also be accelerated by such activities. Those with a modern worldview (i.e., those who focus on the vast possibilities of technology and economic growth) are not limited to oil and gas oligarchs in Russia, but also include the state-run oil company of Norway and many multinational energy corporations. The prevailing argument is that new technologies in carbon capture and storage, and eventually de-carbonization technologies, will allow fossil fuels with low emissions of greenhouse gases to be used in distributed sources, such as automobiles (Metz et al., 2005). However, this vision is not shared by many concerned with the ecological impacts of carbon capture and storage, or with the complexity of impacts of climate change and the consequences for humanity. Indigenous groups and Arctic residents hold different perspectives, which in some cases reflect traditional worldviews, and in other cases reflect a concern with equity and human rights (Krupnik & Jolly, 2002). The conflict of values in the Arctic is not trivial, and has implications for all of humanity. An integral approach that focuses on stages of human development can potentially help to identify new ways of discussing the issues to get to solutions that can "transcend and include" the objectives of modernism, which focus on developing the Arctic and its rich resources, and the concerns of postmodernism (i.e., for environmental and human security).

Conclusion

I have argued that an integral approach to climate change is both urgent and necessary. Climate change scientists can benefit from an integral approach, as it provides an inclusive framework that can guide interdisciplinary research. Policy makers and practitioners who deal with the complex challenges of global warming, amidst many other processes of change, can also benefit from an integral approach, which draws attention to human development and relationships to culture, values, and worldviews. Focusing on *change*, rather than on climate, allows one to see obstacles to and opportunities for re-

sponding successfully to climate change.

Currently, some in the climate change research and policy communities argue that increased scientific knowledge and reduced uncertainty is a prerequisite for actions to reduce the impacts of climate change (Dessai et al., 2007). Other researchers and activists take it for granted that everyone is—or should be—concerned with climate equity and justice, that everyone places equal value on future generations, and that everyone understands the stakes and will respond rationally to avoid costly or dangerous outcomes. The focus has thus been on providing information and explaining the science of climate change and its impacts and significance to diverse groups. Yet this has not been a particularly effective strategy, and greenhouse gas emissions are rising faster than anticipated (*Los Angeles Times*, 2008). Given that actions taken in the next decade may be decisive in influencing future rates and magnitudes of change, insights from integral theory may provide new ways to facilitate rapid transformation. At the least, it offers a framework for understanding change, including evolving perspectives on environment–society relationships. Recognizing the depth of the human dimensions of climate change may be essential to responding to the enormous challenges posed by climate change.

To conclude, it is important to note that climate change is almost always represented as bad news, except among skeptics who argue that a warmer world may be more beneficial for human beings than a cold world. However, climate change may also be good news: never before in human history has there been such strong evidence that we live in an interconnected world, where actions taken in one place have consequences in another. The notion of winners and losers, which has been a driving force for competition among individuals and between groups and states, becomes an illusion as the process of climate change accelerates. Inequality and injustices that have persisted throughout history must be confronted in order to address climate change, and there is now a window of opportunity to recognize that human well-being and human security are really about the connections and relationships among different perspectives. In other words, climate change forces us to realize that the "I, we, and it(s)" are in this together.

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