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Global environmental change II: From adaptation to deliberate transformation

Karen O'Brien
University of Oslo, Norway

Abstract
This progress report considers the need for developing a critical body of research on deliberate transformation as a response to global environmental change. Although there is a rapidly growing literature on adaptation to environmental change, including both incremental and transformational adaptation, this often focuses on accommodating change, rather than contesting it and creating alternatives. Given increasing calls from scientists and activists for transformative actions to avoid dangerous changes in the earth system, and the likelihood that 'urgent' solutions will be imposed by various interests, many new and important questions are emerging about individual and collective capacities to deliberately transform systems and structures in a manner that is both ethical and sustainable. This presents a transformative challenge to global change science itself that calls for new approaches to transdisciplinary research.

Keywords
adaptation, climate change, global environmental change, transformation

I Introduction

The news is full of stories about the inevitability of environmental change, whether it is in relation to the climate, the rapid loss of biodiversity, or the degradation of marine ecosystems. There is a growing recognition that society must adapt to these changes, not only because earth system dynamics mean that some changes are inevitable, but also because actions that address the root causes of global environmental change seem to be elusive. In fact, some now consider that adapting to temperature increases of 4°C or more may be required in the course of this century (New et al., 2011; Parry et al., 2009; Stafford Smith et al., 2011). There has consequently been an enormous increase in the academic literature on climate change adaptation that analyses and assesses how households, communities, sectors and society in general can respond to changing conditions and new risks (Adger et al., 2009a; Ford and Berrang-Ford, 2010; Hovelsrud and Smit, 2010; Pelling, 2011; Schipper and Burton, 2008; Smit et al., 2001).

Adaptation has emerged as an important research theme in geography, as witnessed in the many paper sessions organized at recent conferences. Geographers contribute to this field through strong place-based analyses that take into account the wider context, whether in relation to urbanization, food systems or governance. The research field on adaptation to environmental

Corresponding author:
Department of Sociology and Human Geography, University of Oslo, PO Box 1096 Blindern, 0317 Oslo, Norway
Email: karen.obrien@sosgeo.uio.no

change focuses not only on what to do, or when and how to do it, but also on the limits to adaptation (Adger et al., 2007, 2009b; Pelling, 2011). In particular, questions have been raised regarding whether humans actually have the capacity to adapt to complex, non-linear and in many cases irreversible environmental changes. A natural follow-up question is 'do we have a choice?'.

Choice refers here not only to adaptation, but also to our ability to shape the social and environmental conditions of the future. The question of choice is a tricky one, and it draws attention to a number of core issues within the natural sciences, social sciences and humanities. These include biogeophysical questions about causality and attribution of environmental changes; philosophical questions about human agency and intentionality; psychological questions about cognition and risk perception; theological questions about fate and faith; social questions about voice and inclusion; economic questions about rationality and costs; and political questions about democracy, interests and power.

Interestingly, within much of the research on the human dimensions of global environmental change, there seems to be an implicit assumption that humans have a limited (and linear) capacity to deliberately (and deliberatively) effect change. In terms of adaptation, individual and collective agency is well recognized, and many strategies and actions for responding to change have been discussed. Yet adaptation responses to environmental change often seem to be constrained by the projections of climate models and integrated assessment models, as if the future has already been decided and the challenge is for humans to adapt. A recent *Progress in Human Geography* Forum discussed the dangers of environmental determinism, including the risk of simplifying the causal drivers of global environmental change (Radcliffe et al., 2010). One wonders whether current approaches to climate change adaptation represent a new form of environmental determinism, in that many now consider it easier to accept future temperature increases of up to 4°C or more within this century (along with other environmental and social changes) than to pursue transformative strategies to avoid such changes.

'Adaptation' is clearly a necessary choice, but it is only one of numerous plausible alternatives. As John Holdren is often quoted in relation to climate change (see Kolbert, 2009): 'We basically have three choices: mitigation, adaptation and suffering. We're going to do some of each.' Yet what about other options? A fourth potential response to global environmental change – transformation – has been given less attention within research and policy circles. In one sense this is not surprising, as transformation often challenges the status quo, threatening those who benefit from current systems and structures (Pelling, 2011). However, in light of increasing calls for urgent and rapid responses by scientists and activists concerned with global sustainability (Brown et al., 2011; Hamilton, 2010; Hansen, 2007; McKibben, 2010; Speth, 2008; WGBU, 2011), the lack of a critical, integrated body of research on transformation is both surprising and disconcerting.

In this progress report (my second of three), I argue that a new science on deliberate transformation is needed to both complement and supplement current research on adaptation. I first discuss some of the constraints imposed on adaptation research by the current framing, arguing that it fails to engage with the real 'adaptive challenge' of climate change, i.e. a questioning of the assumptions, beliefs, values, commitments, loyalties and interests that have created the structures, systems and behaviours that contribute to anthropogenic climate change, social vulnerability and other environmental problems in the first place. I then consider some of the key arguments and elements of critical, integrative research on deliberate transformation. Finally, I reflect on the demands that this research agenda places on science itself.

II Is adaptation enough?

Attention to climate change adaptation has expanded rapidly over the past decade within the areas of research, policy and practice. As recently as 20 years ago there was very little talk about adapting to environmental change. This was a period when problems of climate change, biodiversity loss, land-use change and pollution were considered to be manageable, particularly through international environmental agreements and protocols (Barrett, 2003). For a number of years, discussions of adaptation as a response to climate change were considered politically incorrect, as they could draw attention and resources away from the need to reduce greenhouse gas emissions (i.e. climate change mitigation) (Schipper, 2006). Indeed, very few research articles on adaptation were published during the 1990s (Janssen et al., 2006). However, there has been a significant increase in research on adaptation in recent years, as a result of the growing acknowledgement that some climate change is inevitable due to past emissions and system lags, regardless of current mitigation efforts.

Climate change adaptation has been defined as:

> adjustments in ecological, social, or economic systems in response to actual or expected climatic stimuli and their effects or impacts. It refers to changes in processes, practices, and structures to moderate potential damages or to benefit from opportunities associated with climate change. (Smit et al., 2001: 879)

This definition draws attention to the technologies, regulations, policies and practices that enable society to live with change. Adaptation seeks to reduce vulnerability to present and future change by minimizing the direct and indirect impacts. It is interpreted here as a technical challenge, or one that requires expertise, resources, technologies, changes in management or procedures, etc. (Heifetz et al., 2009). To meet this technical challenge, considerable emphasis has been placed on developing adaptation strategies, tools and measures in response to scenarios and projections of future climate change (Nelson et al., 2007).

Adaptation has other definitions as well, as discussed by Orlove (2009). In a broad sense, adaptation refers to the act of making something fit for a new situation or use. From this perspective, it involves not only adapting to future temperature and precipitation scenarios, but also adapting to other changes, such as the economic consequences of globalization, demographic changes or urbanization. Empirical research shows that most people are adapting to multiple processes, without differentiating responses to one stressor from the other (Eakin, 2006; Leichenko and O'Brien, 2008; Wilbanks and Kates, 2010). Whether adaptation is interpreted narrowly to refer only to climate change or broadly to refer to multiple changes, a key question addressed in research is 'what is being adapted to?'. Yet perhaps a more contentious question that is often neglected is 'why adapt?'.

Pelling (2011) argues that current modes of defining adaptation are aimed at accommodating change, rather than contesting it. This means that current systems and paradigms are accepted and in some cases modified, but rarely critically questioned or challenged. As Paolo Freire (1970) pointed out in his work on education, the well-adapted human is one who does not problematize the changes that are being adapted to – a situation that conveniently suits the needs of the oppressors: 'The more completely the majority adapt to the purposes which the dominant minority prescribe for them (thereby depriving them of the right to their own purposes), the more easily the minority can continue to prescribe' (Freire, 1970: 76). This raises some critical issues when it comes to adapting to environmental change, particularly in relation to *who decides* on the magnitude, extent and types of changes (i.e. whose purposes), and *what the alternatives are*.

Freire argued for a dialogical approach to education that accepted and promoted humans

as conscious beings – not only conscious of objects and the world around them, but exhibiting 'consciousness as consciousness *of* consciousness' (Freire, 1970: 79, italics in original). This is significant in terms of responding to global environmental change, as humans not only are contributing to changes in the earth system, but they are also capable of recognizing, reflecting and consciously taking actions to influence future outcomes (Speth, 2008). The notion of humans as active creators of change is by no means widely accepted, and in fact it directly conflicts with some belief systems and world-views (O'Brien and Hochachka, 2010). The idea that humans can influence the future of the planet may, in and of itself, represent a fundamental 'adaptive challenge' that calls for a questioning of values, beliefs and loyalties, as well some commonly held assumptions about human-environment relationships (Heifetz et al., 2009).

III The science of deliberate transformation

Transformation is increasingly presented by scientists and activists as the 'solution' to environmental change and social sustainability. This raises a number of important questions. What exactly do we mean by transformation? What types of transformations are considered necessary and why? Who decides? Can transformations be carried out in a deliberative, participatory manner that is both ethical and sustainable? How can it occur at a scale that will make a difference?

Transformation can be defined as physical and/or qualitative changes in form, structure or meaning-making (Folke et al., 2010; Nelson et al., 2007; Pelling, 2011). It can also be understood as a psycho-social process involving the unleashing of human potential to commit, care and effect change for a better life (Sharma, 2007). Transformation means different things to different people or groups, and it is not always clear what exactly needs to be transformed and why, whose interest these transformations serve, and what will be the consequences. For some, the idea of transformation presents opportunities to innovate, develop renewable materials and technologies, and create 'green' economies (Barbier, 2010). It also presents openings for challenging the global financial system and paradigms of continued economic growth and consumption (Jackson, 2009). For others, it suggests a contraction of freedom that will result in chaos and disruption. It can be perceived as dangerous by some and instrumental by others, leading to trade-offs and conflicts that can result in real or perceived winners and losers at different scales (O'Brien and Leichenko, 2003; Pelling, 2011; St. Clair, 2006).

A distinction can be made between transformation as a deliberate process and transformation as an unexpected or unintended outcome of a process or event (Nelson et al., 2007). Deliberate transformations are often carried out with the intention of achieving a particular goal (e.g. the end of slavery or the right of women to vote). Such transformations are also referred to as 'directional transformations' (Chapin et al., 2009) or 'purposive transformations' (Berkhout, 2002). They are not about social engineering or 'designing' the future, but rather about recognizing that some fundamental shifts are necessary to enable desirable futures to emerge (Miller, 2007). While there are diverse perspectives on what is a desirable future, there are many normative arguments for prioritizing both ethics and sustainability (Irwin, 2010). The shifts called for may include a combination of technological innovations, institutional reforms, behavioural shifts and cultural changes; they often involve the questioning of values, the challenging of assumptions, and the capacity to closely examine fixed beliefs, identities and stereotypes. Deliberate transformations are often initiated by small groups of committed individuals, sometimes operating in shadow networks (Olsson et al., 2006; Pelling et al., 2008). However, to be successful they typically require changes to entrenched systems maintained and

protected by powerful interests. There are, consequently, enormous barriers to transformation, rooted in culture and cognition and expressed through economic and social policies, land-use legislation, resource management practices, and other institutions and social practices (Kegan and Lahey, 2009; Moser and Ekstrom, 2010; Pelling, 2011; Shove et al., 1998).

A considerable amount of work on deliberate (or directional) transformation in response to environmental change has been carried out in relation to ecosystem stewardship and adaptive governance (Chapin et al., 2009; Folke et al., 2010; Gunderson and Holling, 2002; Olsson et al., 2006). This research emphasizes the creative tensions between resilience and transformation, noting that the latter is often triggered by crises or regime shifts. There has also been a large body of research on industrial transformations, which emphasizes the relationships between society, technology and environmental change, including innovations in production and consumption systems that are consistent with pathways towards sustainability (Berkhout, 2002; Olsthoorn and Wieczorek, 2006). Research on transformation within human geography appears to be largely embedded in adaptation research, particularly within studies that refer to the concept of resilience (Moser and Ekstrom, 2010; Nelson et al., 2007; Pelling, 2011). This adaptation literature distinguishes between incremental adjustments and transformational responses. As Pelling (2011) argues, the branch of transformative adaptation is inherently linked to framings of vulnerability that recognize its social, political and cultural roots. Moser and Ekstrom (2010) point out that system-scale transformations introduce different and more challenging barriers than incremental adaptation. In response to these barriers, there is growing recognition of the role of transformative learning and transformative leadership in facilitating change (Heifetz et al., 2009; Tschakert and Dietrich, 2010).

Transformations may occur across multiple dimensions and scales, and in different contexts and settings. These can include the transformation of energy and agricultural systems, financial systems, governance regimes, development paradigms, power and gender relations, production and consumption patterns, lifestyles, knowledge production systems, or values and world-views. Insights on deliberate transformation at the scale and speed that is considered necessary to address environmental challenges are likely to benefit from transdisciplinary approaches that pay attention to the relationships between personal, organizational, cultural and systems transformations, as well as the dynamics between individuals and groups in the era of new communication technologies and social networking (Brown et al., 2011; Christakis and Fowler, 2009).

There are many theories, frameworks and approaches that provide insights on transformative responses to global environmental change, including literature on critical realism (Bhaskar et al., 2010), cultural theory (Rayner and Malone, 1998; Thompson, 2008), political ecology (Forsyth, 2003), post-normal science (Funtowicz and Ravetz, 1994; Ravetz, 2007), integral theory (Esbjørn-Hargens, 2010; O'Brien, 2010), resilience thinking (Gunderson and Holling, 2002; Walker and Salt, 2006), action inquiry and research (Reason and Bradbury, 2004; Torbert and Associates, 2004) and transformative learning (Mezirow, 2000). Understandings of social and environmental transformations can also draw upon recent research on critical poverty (St. Clair, 2006), human security (O'Brien et al., 2010), development and climate ethics (Gasper et al., forthcoming), deliberative democracy (Dryzek, 2011), sociotechnical transitions (Berkhout, 2002; Geels, 2002), ecosystem stewardship (Chapin et al., 2009; Folke et al., 2010), vulnerability and adaptation (Mearns and Norton, 2010; Pelling, 2011), organizational behaviour (Heifetz et al., 2009), psychology (Oskamp, 2000; Swim et al., 2011), philosophy (Irwin, 2010) and futures studies (Riedy, 2011). In fact, transformation has been a key theme in social

science research in both the modern and postmodern periods, alongside philosophical thinking about the role of humans in processes of change (Boudon, 1986; Held et al., 1999; Polanyi, 1944; Turner et al., 1990). Yet it is not clear whether these diverse strands of research are sufficient to inform strategies and actions for deliberate, ethical and sustainable transformation at the rate and scale that is deemed necessary to avoid danger to humanity. It may be that new questions must be asked and bolder answers proposed, and that – to make both possible – many of the barriers between disciplines and approaches must be addressed.

Greater attention to the potentials and dangers of deliberate transformation is clearly relevant at a time when geo-engineering schemes are being promoted as rational, cost-effective responses to environmental risk (Victor et al., 2009); when placing democracy on hold has been raised as an option for effectively managing environmental change (Lovelock, 2009); and when global crisis plans are being developed in response to a potential demand for emergency action (Randers and Gilding, 2010). Even transformations along pathways towards greater justice, equity and long-term resilience are likely to raise contentious debates about the meaning of progress, prosperity and human development (Jackson, 2009; St. Clair, 2006). As with mitigation, adaptation and suffering, transformation as a response to environmental change is likely to be challenged, contested and resisted. For this reason alone, it is an area that is ripe for research.

IV Is science up to the challenge?

There is growing consensus among global change researchers that humans have exceeded several planetary boundaries, and that there is a real risk of reaching potential tipping points in the Earth system that pose significant dangers to human civilization (Lenton et al., 2008; Rockström et al., 2009). In response to these threats, the scientific community has identified a number of 'Grand Challenges' for global change research over the next decade (ICSU, 2010; Reid et al., 2010). These challenges include research on forecasting, observing, confining, responding and innovating. The need to explore social transformations to overcome barriers to sustainability and to better determine strategies for avoidance, adaptation or transformation of social-environmental systems are recognized as part of the grand challenges, specifically within the theme of 'confining': *What strategies for avoidance, adaptation and transformation are effective for coping with abrupt changes, including massive cascading environmental shocks?* (ICSU, 2010: 15). While this is an important question, there are many other aspects of deliberate transformation that need to be addressed. For instance, power, politics and interests can present formidable barriers (or pathways) to transformation, yet they are often 'invisible' within systems analyses (Pelling and Manuel-Navarette, 2011). As another example, the relationship between consciousness and individual and collective transformative action has been largely ignored. Systems theorist Alexander Wendt (2010: 283) challenges us to 'think about the relationship between what are now called levels of analysis not in the vertical discourse of bottom-up and top-down, but the horizontal discourse of 'inside-out' and 'outside-in'.

Many argue that there is a need for transformation of dominant ontologies of climate change, and of dominant scientific and cultural paradigms (Hulme, 2009). Global environmental change research may thus demand a new approach to both conducting and communicating science that is based upon innovative transdisciplinary approaches (Wickson et al., 2006). Such approaches emphasize transformative learning, which refers to:

> the process by which we transform our taken-for-granted frames of reference (meaning perspectives, habits of mind, mind-sets) to make them more inclusive, discriminating, open, emotionally capable

> of change, and reflective so that they may generate beliefs and opinions that will prove more true or justified to guide action. (Mezirow, 2000: 7–8)

This includes the capacity to become critically aware of one's own assumptions (and those of others), the capacity for critical reflection and open-mindedness, and the capacity to take in multiple perspectives and viewpoints, including those that challenge prevailing norms and interests (Barber, 1961; Mezirow, 2000). This involves the recognition and integration of subjective and objective realities and multiple types of knowledge, which depends on insights from the social sciences, humanities and natural sciences.

Such approaches, however, are not always easy to pursue within the current research environment. It is often easier to *argue for* innovative thinking than to *engage in* it, as demonstrated in the literature on 'triple-loop' (reflexive) learning (Argyris and Schön, 1978; Flood and Romm, 1996; Scharmer, 2009; Torbert and Associates, 2004). To meet the Grand Challenges, it may be necessary to identify individual and collective 'blind spots' in current thinking that 'reveal themselves in our theories and concepts in the form of deep epistemological and ontological assumptions' (Scharmer, 2009: 22). Although adaptation is certainly necessary in response to inevitable changes, deliberate transformation may represent a much broader adaptive challenge that calls for deeper inquiry into structures of meaning making – not only within society, but within science itself.

V Conclusion

In my last progress report (O'Brien, 2011), I discussed the role that human geographers can play in contributing to a new science of global environmental change. In that report, I emphasized the need to gain a deeper understanding of the human dimensions in order to inform transformative responses to complex problems such as climate change. However, reflecting on the dominant research themes presented at the 2011 Conference of the Association of American Geographers and published in leading geography journals, it becomes clear that the majority of the research in geography focuses on adapting to changes that are under way or expected, rather than on research that helps us to understand how to deliberately transform systems and society in order to avoid the long-term negative consequences of environmental change. Although much of this adaptation research provides important insights on transformation, there remains a fine line and considerable tension between accommodating change and consciously creating alternatives.

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