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Biopolitics and Adaptation: Governing Socio-Ecological Contingency Through Climate Change and Disaster Studies

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Text

Abstract

This paper brings together Foucauldian approaches to biopolitics and recent developments in climate change and disaster studies on vulnerability, adaptation, and resilience to develop a biopolitics of adaptation. I approach climate change impact assessments, vulnerability approaches, and resilience approaches as distinct systems of knowledge with biopolitical effects. This means that each renders life amenable to governmental intervention and control through specific sets of techniques and rationalities that produce "truths" about emergent life and how to secure this life. A biopolitical reading offers a critical alternative to conventional narratives of these fields' development, which suggest that the emergence of vulnerability and resilience approaches provide progressively more complex accounts of risk that shine new light on the "vulnerability puzzle." In contrast, this review suggests that the emergence of vulnerability and resilience approaches allow researchers and practitioners to target increasingly intimate levels of socio-ecological life, the affective relations between people and their environments. In drawing attention to the often under-acknowledged politics of life at play in climate change and disaster studies, this review seeks to highlight possibilities for a subversive and affirmative biopolitics of adaptation that transgresses rather than sustains existing political ecological order.

Introduction

The concept of adaptation has come of age in the past decade. Climate change researchers and policymakers have made adaptation a key climate policy goal alongside mitigation, as they increasingly recognize that people are already adapting to climate change's effects (Burton et al. 2002; Pielke et al. 2007). At the same time, disaster management's growing interest in resilience has directed analytical attention away from structural determinants of vulnerability and towards the cultural and subjective factors that influence individual and systemic adaptive capacity (Brown and Westaway 2011). Indeed, while adaptation and resilience are distinct concepts with unique lineages (see Pelling 2010), they increasingly provide a common foundation for academics and practitioners working on issues of vulnerability, adaptation, and resilience in a variety of fields of study (Eakin and Leurs 2006; G. O'Brien et al. 2006). The focus here is on operationalizing, understanding, and improving individual and systemic adaptive capacities or the ability to cope with environmental change and surprise (Nelson et al. 2007).

At the same time, adaptation has garnered a different kind of interest in post-9-11 security and development programming. Researchers in political geography and critical security studies have increasingly drawn on Michel Foucault's notions of biopower to demonstrate how global liberal governance problematizes adaptability as the source of and solution to qualitatively new experiences of threat and insecurity, such as global terrorism (Martin 2007), dangerous climate change (Grove 2010), and pandemic disease (Braun 2007). Biopower signals a form of power that promotes the security and well-being of individual and collective life. It operates through contextually specific configurations of techniques of discipline, biopolitics, security, and

environmental power that improve life by targeting the individual, the population, its milieu (or setting), and the relations amongst people and things that comprise a milieu, respectively (Foucault 2007, 2008; Anderson 2012; Collier 2009; Grove 2013b). As such, the concept of biopower enables a topological analysis of the "multitude of force relations that act and react amongst each other" within a problem space in which life is made amenable to calculated programs of governmental intervention and improvement (Lazzarato 2006, 12; see also Collier 2009). This topological account of power is an alternative to modernist political imaginaries centered on a sovereign subject, whether this is the state or the rights-bearing individual. From a biopolitical perspective, power operates not simply through sovereignty's laws or prohibitions but also through shifting regimes of power/knowledge and governmental technologies that operate beyond the state. By power/knowledge, I mean more or less sedimented and institutionalized practices that structure what counts as true or false knowledge in specific times and places (Dean 2004). Government refers to calculated efforts to regulate others' beliefs and practices; in Foucault's famous phrasing, it is the "conduct of conduct" (Foucault 1982). Accordingly, biopower produces knowledge of the processes that sustain or inhibit various life processes, thus rendering "life" as such amenable to calculatory programs of governmental intervention and control (Dillon 2007; Duffield 2007).

This article attempts to bridge these disparate bodies of research through a review of what I call the biopolitics of adaptation. In what follows, I approach climate change impact studies, vulnerability approaches, and resilience approaches as systems of knowledge (Foucault 1972) with biopolitical effects. They are biopolitical not because they utilize techniques of biopolitics, such as statistics, but rather because they endeavor to render life amenable to calculated governmental interventions. As I will show, each system of knowledge produces truths about uncertain life and how to secure this life through specific techniques of knowledge production such as models, risk assessments, scenarios, focus groups, and transect walks, each of which is mobilized in relation to specific understandings of vulnerability and adaptation. This paper thus offers a *counter-history* of research on vulnerability, adaptation, and resilience. Where conventional accounts stress how research on hazards and impacts, vulnerability, and resilience offer distinct insights on different pieces of the "vulnerability puzzle" (Eakin and Lemos 2006), I demonstrate how changes in these fields revolve around shifting problematizations of life or how life is rendered a problem requiring governmental intervention. The gap between life and power that life's problematization signals is conventionally discussed in terms of a disconnect between policy and practice (e.g., Comfort et al. 1999; Sotarauta and Srinivas 2006). However, in biopolitical terms, the continued inability of practitioners and researchers to guide the adaptation process (see Boyd and Juhola 2009) reflects how life – practice – constantly *exceeds* and *confounds* their attempts to secure the future through, *inter alia*, impact assessments, vulnerability reduction, and resilience-building activities. As such, a counter-history details how new approaches within climate change and disaster studies emerge in response to the failures of their predecessors to fold life into a calculative rationality.

Research in climate change and disaster studies thus produces a series of truths on the nature of adaptation that opens individual and collective socio-ecological relations to governmental intervention and regulation. However, this is not simply an academic exercise in critique: the goal here is to open provocative new avenues for thinking the ethics and politics of climate change adaptation and disaster resilience. A counter-history of vulnerability, adaptation, and resilience seeks to combat the ongoing depoliticization of vulnerability in these fields of study by recognizing how they extend the reach of global liberal governance to the socio-ecological relations that comprise everyday life, in often unintended ways.

The remainder of the paper is structured as follows. After an overview of research on biopolitics and governing uncertain futures, I review research on, respectively, impact assessments, vulnerability approaches, and resilience, focusing on their underlying biopolitical problematic. A brief conclusion considers the possibilities for an affirmative biopolitics of vulnerability reduction and resilience.

Topologies of Power and Life

While there are numerous approaches to biopolitics (see Campbell 2011; Coleman and Grove 2009), the Foucauldian approach outlined above is the foundation for recent work in political geography and critical security studies on governing uncertain futures. Here, biopower signals a "problem space in which diverse topologies of power may be observed" (Collier 2009, 80; see also Grove 2013b). The problem space in question here is circumscribed by new understandings of life in terms of interconnection, complexity, and emergence. Genealogies of global liberal governance (Dillon and Reid 2009) and its attendant rationalities of vital systems security (Collier and Lakoff 2008, 2009) have documented how new military practices such as air and atomic warfare gave rise to new understandings of life as interconnected flows of people, resources, information, and capital sustained by critical infrastructure. This life is always vulnerable because the infrastructure systems it depends on are always susceptible to attack. Key for our purposes here, this understanding of life and (in) security gave rise to complex systems theory and accordingly influenced diverse research areas, including molecular biology, ecology, computer programming, finance, and disaster management. Accordingly, research on governing uncertain futures thus strives to inductively identify the specific techniques, governmental rationalities, and forms of knowledge practitioners utilize to render an emergent future visible, and their biopolitical effects (e.g., Aradau and van Munster 2013; Cooper 2008, 2010; Dalby 2013; Duffield 2011; Grove 2012; Lentzos and Rose 2009). For example, Ben Anderson (2010a,2010b) has shown how different forms of "anticipatory action", such as preparedness, preemption, precaution, and resilience, rely on imaginary, calculative, and performative practices to visualize an uncertain future and bring this future to bear on life in the present.

This approach to biopolitics offers a unique and largely unexplored window on the shifting forms of knowledge within climate change and disaster studies. Climate change and disaster management are distinct bodies of research with unique histories (Burton et al. 2002). Nonetheless, they have recently begun to overlap, as researchers and policymakers increasingly recognize that adaptations to short-term surprises and reducing hazard vulnerabilities can help build adaptive capacities for climate change's long-term effects (G. O'Brien et al. 2006). The biopolitical problem of security is all-important: these fields of study take as their core problem the question of how to understand and secure emergent life against an unpredictable future. Accordingly, the next three sections review how the fields of climate change impact assessments, vulnerability approaches, and resilience attempt to understand and manage emergent life and thus govern an uncertain future.

Impact Assessments: Securing an Ordered Life

A widely cited guidebook suggests the following seven steps for conducting climate change impact and adaptation assessments (Carter et al. 1994, v):

1 definition of the problem;
2 selection of the method;
3 testing the method;
4 selection of scenarios;

5 assessment of biophysical and socio-economic impacts;
6 assessment of autonomous adjustments; and
7 evaluation of adaptation strategies.

To put this analytical machine in motion, the researcher selects a specific type of impact (sea-level rise, rainfall, flooding, drought, and so forth) on a particular sector (such as energy production or agriculture) within a specified geographic area of analysis (river basin, country) and over a specific period of time (usually a matter of decades). With the problem domain established, the researcher then uses models and scenarios to estimate future impacts. This requires three types of models arranged in a specific and hierarchical sequence. First, climate models predict future rainfall and temperature levels. Second, biological, ecological, and physical geographical models project the environmental impacts that result from these climatic changes. Finally, economic models forecast the impact these biophysical changes will have on productive human activities. To calculate climate change impacts, two simulations are required: first, a model of environmental changes and economic impacts that does not include future climate change; second, an impact model that does include this factor. The difference between the two projections is the predicted future climate change impact. With impacts modeled, the research then moves on to evaluate and recommend adaptation options. The goals of adaptation are relatively straightforward: to promote sustainable development and reduce vulnerability to future climate changes through both anticipatory and reactionary actions. If predicted impacts are minor, few adaptations will be necessary to ensure continued growth and development; the system thus has low vulnerability. However, if predicted impacts are high, existing adaptations may not be adequate; the system thus has high vulnerability.

This framework exemplifies what researchers refer to as "first-generation" (Füssel and Klein 2006), "residual" (Kelly and Adger 2000), or "outcome" vulnerability (K. O'Brien et al. 2007; Yamane 2009). Here, vulnerability is what is left after expected adaptations reduce but do not eliminate the projected impacts of climate change scenarios. Vulnerability need not exist; it is rather a potential future condition that results from inadequate adaptations to future climate changes. Likewise, adaptation is a matter of future concern. It is only necessary if predicted climate change impacts exceed acceptable levels. Moreover, adaptation is a technical rather than a political economic or cultural issue. Scientists present objective adaptation assessments to policymakers, who then rationally proceed to implement their recommendations.

The utility and value of this approach to vulnerability and adaptation derive from its mobility and flexibility. The purpose of the framework outlined above, according to its authors, "is to enable estimations of impacts and adaptations which will allow comparable assessments to be made for different regions/geographical areas, sectors, and countries" (Carter et al. 1994, v). This directly contributes to one of the requirements of Article 4 of the UN Framework Convention on Climate Change (UNFCCC) (Carter et al. 1994, v) and indirectly advances the UNFCCC's overarching goal to prevent "dangerous anthropogenic interference in the climate system" (UNFCCC 1992: 4). In offering standardized, uniform, and comparable appraisals of future climate change vulnerabilities across a range of sectors and regions, this framework assists efforts to clarify dangerous levels of climate change: if an unacceptably high level of vulnerability remains after expected adaptations fail to reduce projected impacts of specific climate change scenarios, then this scenario is labeled "dangerous" (K. O'Brien et al. 2007). This is the first step towards preventing dangerous climate change (Burton et al. 2002). A sector, system, or region identified as vulnerable to dangerous climate change becomes a target for various interventions that aim to prevent unacceptable impacts from occurring.

In biopolitical terms, impact assessments render life as inherently ordered and stable, threatened by uncertainty that lies in nature (see Hewitt 1983). The regularity of everyday life will only be disturbed by climate change if impacts exceed adaptations and thus create vulnerability. Security against this uncertain future can thus be achieved through modeling and simulation techniques that enable policymakers to visualize uncertainty and devise the appropriate adaptive interventions to prevent or at least minimize vulnerability. Interventions usually involve some form of technology transfer that enables vulnerable peoples and places to more adequately predict, plan, engineer, and prepare for future climate change (cf. Grove 2010; Hewitt 1996).

The biopolitical problematization at the heart of impact assessments is thus the gap between *representations* of future impacts in scenarios and models and the reality of climate change as the future unfolds. Security is a problem of imprecise modeling that creates uncertainties about future impacts and the proper course of action. This is especially the case where social actors are considered, because the uncertainty surrounding the accuracy of economic modeling hinders the ability of science to objectively specify what needs to adapt and how adaptation should proceed (Burton et al. 2002; Cutter et al. 2003). Uncertainty surrounding impact projections can also prevent policymakers from reaching agreement on the proper course of action and thus hinder their implementation of adaptation policy. Accordingly, adaptation requires more and better modeling: improved adaptation policy will follow once models and scenarios are perfected; the only problem is to develop new and better ways to quantify the various components of vulnerability and adaptive capacity (Cutter 2003).

Although impact assessments still play an important role in adaptation planning, researchers now recognize that the capacity and knowledge to adapt is no guarantee that the proper adaptations will in fact be taken. Instead, a variety of intervening factors affect the implementation of adaptation policies and recommendations (Urwin and Jordan 2008). This realization has been driven by a host of factors both internal and external to the field of research. New experiences of existing climate change and a heightened sensitivity to the "fabricated uncertainty" (Duffield 2011) of neoliberal development drive home that vulnerability exists in the here and now (see also K. O'Brien and Leichenko 2000; Wisner 2003; Schipper and Pelling 2006; Dalby 2009). Ethnographic analyses have also detailed the myriad ways peoples around the world are already adapting to climate change and political economic marginalization (Adger et al. 2005; Heijmans 2004; Hilhorst and Bankoff 2004). These new experiences introduce a new understanding of life. No longer is life thought as inherently stable and ordered, separated from an unruly nature; it is now generally recognized as unstable, disordered, and interconnected. Vulnerability and resilience approaches offer two distinct ways of understanding and managing this emergent life; each is considered in turn.

Vulnerability: The Production of Logistical Life

Vulnerability approaches have their conceptual roots in radical disaster studies. A forerunner to political ecology, radical scholars argued that vulnerability is a product of uneven political economic relations that make some people and places more vulnerable to both long-term environmental change and extreme events (e.g., Hewitt 1983; O'Keefe et al. 1976; Watts 1983). Vulnerability here is an ontological affliction, an unavoidable condition of life in the global political economy. As such, vulnerability provided a conceptual foundation for radical disaster management approaches that drew on Freirian pedagogy and participatory ethnographic methods to advocate for fundamental political economic changes in order to address the structural causes of vulnerability (Maskrey 1989; Wisner et al. 1977).

In the mid-1990s, researchers operationalized vulnerability through articulating political economy approaches with research on entitlements and human ecology approaches (e.g., Bohle et al. 1994). This introduced a subtle but important change in how vulnerability is understood. Vulnerability is *socially constructed* – not simply a product of political economic inequalities but rather of the complex interlinkages between natural hazard exposure and socially determined abilities to cope with change (Blaikie et al. 1994; Kelly and Adger 2000; Wisner 1993). Moreover, because vulnerability is inescapable, researchers also recognize that adaptation is an everyday process in which people necessarily engage in order to survive (Adger and Kelly 1999). Adaptation is no longer prior to vulnerability; the latter forms the context in which the former occurs (Burton et al. 2002).

This reconfigured understanding of vulnerability and adaptation offers researches and policymakers a new surface on which they can grasp an uncertain future. Because "the complexity of present systems belies a reductionist approach [to vulnerability]" (Bohle et al. 1994, 44), abstract and generalizable models lose their pride of place. Instead, ethnographic case study methods offer contextualized knowledge that can be utilized to address current rather than future vulnerabilities. Methods such as focus groups, interviews, participatory mapping, and transect walks with community members provide an empirical account of specific exposures as well as existing capacities and needs (Ford and Smit 2004; Keskitalo 2004; van Aalst et al. 2008). The task of participatory research is twofold: first, to identify through participatory and ethnographic methods the adaptive practices that people use in their everyday lives to cope with risk, uncertainty and insecurity (Adger et al. 2005; Hilhorst and Bankoff 2004); second, to identify the wider social, cultural, and institutional constraints that limit these capacities. Only after the researcher muddies her proverbial boots will she consult models of future environmental changes within the region and assess peoples' future needs (Smit and Wandel 2006).

The impossibility of creating generalizable knowledge on adaptation prevents the development of an overarching international framework that can guide adaptation policymaking and its implementation. In such conditions, the role of the researcher is to passively "react" to peoples' autonomous adaptations by cataloging and describing them, rather than actively driving forward the adaptation process through informed and objective recommendations (Boyd and Juhola 2009). Uncertainty thus continues to underpin security concerns surrounding adaptation, but it now occupies a new location and takes on a new form. It is no longer found in the gap between quantitative representations and reality; rather, it inhabits the gap between policy or strategic planning and its implementation in everyday practice (Comfort et al. 1999; Quarantelli 1998). This is a new kind of uncertainty, which of the sovereign, subjective decision unmoored from an objective and technocratic basis for decision-making (Ewald 2002).

The biopolitical problem for researchers is no longer how to govern life through better representations of an uncertain future. Instead, research attempts to close the gap between policy and practice by engineering specific forms of individual and collective life in order to remove the uncertainty surrounding everyday adaptations. Intervention targets the social and ecological context – the cultural, biophysical, and technical milieu in which social action occurs – within which adaptation takes place (K. O'Brien et al. 2007). It identifies particular areas of need within a community that can be targeted in order to build the capacities of a population to cope with an uncertain future (Adger et al. 2003). This usually involves some form of behavior modification (Kelly and Adger 2000), whether it is new building practices, educational programs that raise consciousness of new risks, improved building codes and mechanisms for their enforcement, creation of a community disaster management plan through participatory methods, or the removal of a specific hazard within a community.

However, the techniques vulnerability approaches utilize to modify behaviors and engineer "appropriate" forms of life have a wide genealogy that lies in Cold War era civil defense planning in the USA and UK. Civil defense emerged in the 1950s as a strategy to secure collective existence in the face of unpredictable threats, specifically a nuclear weapons attack. Civil defense utilized techniques such as vulnerability analysis, education and training programs, and simulations and scenario exercises to prepare the population to survive future disruptions to its vital infrastructure. Key here is the affective economy of preparedness they generate: vulnerability mapping and simulations engender the fear and anxiety that "we are not prepared," which in turn drives practitioners to constantly improve their readiness (Lakoff 2007). This fear of constant vulnerability was inculcated in the civilian population through training and education programs. Whether it involved students learning to "duck and cover" under their desks, civilians learning the location of fallout shelters in their neighborhood, or housewives taking part in neighborhood civil defense organizations, the effect was the same: to institute an order of fear about the impending future and to adjust one's actions in the present so as to mitigate, to the greatest possible extent, the sources of this fear (Roberts 2006). As such, techniques of preparedness turn unpredictable future catastrophes into vulnerabilities that can be mitigated by behavioral modifications in the present. They are biopolitical technologies that bring a potential future into the present to shape the organization and flow of social life.

To be sure, there are important differences between the precise techniques utilized in civil defense and contemporary vulnerability approaches. Nonetheless, genealogies of civil defense help us recognize a *topological equivalence* between vulnerability approaches and civil defense programming at the level of their *biopolitical effects*. Both produce what Julian Reid (2007) calls "logistical life," a form of networked existence in which flows of people, goods, and information are organized around principles of economic liberalism in strategic relation to an uncertain and threatening future in which the existence of liberal society is itself in question. Vulnerability approaches thus extend rationalities derived from new experiences of warfare to the socio-ecological relations that comprise everyday life: like civil defense, they attempt to engineer socio-ecological milieus in a way that minimizes exposure to surprise (whether nuclear strike or environmental hazard) and disciplines the population to respond (or in this case, adapt) to surprise in ways that do not threaten the existing order of things (Grove 2013a).

This line of critique is not meant to dismiss vulnerability approaches out of hand. Like all governmental technologies, vulnerability reduction techniques are politically polyvalent. Their political effects emerge through the field of force relations in which they are deployed. In this light, a biopolitical perspective highlights how vulnerability has been progressively *depoliticized* since the mid-1990s (Grove 2013a; see Cannon and Mueller-Mann 2010; Gaillard 2010; Middleton and O'Keefe 1998 for similar critiques from different theoretical slants). The newest fold in this depoliticization is the emergence of resilience approaches, to which we now turn.

Resilience: Affecting Everyday Life

Resilience has become a buzzword of sorts, an overarching principle in a number of disparate fields, including ecosystem management, national security, finance, humanitarian assistance, and disaster management (Duffield 2011; Reid 2012; Walker and Cooper 2011). Its conceptual roots lie in both psychology and ecology. In psychology, resilience signals the capacity of people with traumatic childhood experiences to develop into "normal" and psychologically stable adults. In ecology, it refers to the ability of a social and ecological

system to automatically reconfigure itself in response to an external stressor while maintaining the same form, function, and level of ecosystem services. In brief then, resilience focuses on identifying and improving "essential and non-essential elements of community systems able to adapt to and survive shocks" (Manyena 2006, 436).

Resilience offers a radical rethinking of what it means to think about the life and the environment. It is organized around topological and geometric modes of thought attuned to processes of change and becoming rather than permanence, stability, and being (Holling 1992, 1996, 2001). Vulnerability is a dynamic property of a system in which humans interact with the biophysical environment (Eakin and Lemos 2006). As such, vulnerability can never be eliminated, because it is ontological to any system – an inescapable part of life itself (Nelson et al. 2007). Adaptation is thus a necessary condition for life to exist; in a sense, to live is to adapt (Cannon and Mueller-Mann 2010). Adaptation here refers to a self-organizing process of change sustained by information flows and feedbacks between a system and its milieu. Adaptive capacity thus depends on the *quality* of relation between various elements that comprise a system (Nelson et al. 2007). Researchers have operationalized this vision of adaptive capacity through the concept of social capital. In this context, social capital refers to informal social relations and values that determine the choice of adaptive strategies (Pelling and High 2005). Adaptive capacity hinges on both the quality of relations between community members, and their level of participation in decision-making processes (Tompkins and Adger 2004). Unequal participation deters resilience and creates asymmetric distributions of adaptive capacity (Lorenz 2010).

Because adaptive capacity is an emergent effect of socio-ecological relations, resilience programming attempts to work on *how elements within a system relate to each other*, rather than the performance of individual elements themselves. Critical scholars have demonstrated how resilience mobilizes a specific form of biopower, "environmental power," the power not simply to govern life but to produce entire life worlds so as to govern emergent life's possibilities (Anderson 2012; Massumi 2009). In brief, environmental power attempts to influence how the complex of people and things that form a socio-ecological milieu relate to one another. Two examples will illustrate how resilience operates through techniques of environmental power.

The first example involves community-based disaster resilience programming in Jamaica (Grove forthcoming). Participatory techniques such as educational activities and transect walks convey knowledge and information on local hazards, while also shading this knowledge with affective hues of fear and unease. For example, training videos and computer simulations encourage people to see their surroundings – hillsides, rivers, rainfall, and so forth – as threats. Likewise, transect walks and focus groups begin by asking people to describe the disasters they have experienced and how they were affected. Each of these activities attempts to code the environment as a source of fear, in order to compel participation in participatory resilience activities. As such, resilience programming allows disaster management to manipulate the affective relations between people and their environment, in the name of building so-called cultures of safety (see UN 2005).

In this case, environmental power enables researchers to close the gap between policy and practice through engineering the possibilities for life in an emergent environment. At issue here is the possible ways in which a community *might* respond to a disaster (Grove forthcoming). Participatory resilience approaches attempt to build confident, resilient subjects through immaterial interventions that seek to modify social processes, the collective thinking of society, and socio-cognitive factors such as trust and self-efficacy (Blennow and Persson 2009; Tobin 1999). However, their biopolitical effect is to strategically delimit the possible adaptations of individuals and communities. More often than not, this involves adapting in

ways that do not challenge existing socio-ecological order (Reid 2012). Good intentions notwithstanding resilience often reduces adaptation to merely "surviving the after-effects of industrial modernization, the green revolution, and the Washington consensus" (Walker and Cooper 2011, 155).

A second example of environmental power comes from techniques of adaptive management and reflexive governance that resilience programming frequently utilizes. Adaptive management recognizes the inherent limitations of knowledge on social and ecological systems and hence the inability of planning to fully account for all possible eventualities and surprises (Lee 1999; Walters and Holling 1990). Instead, adaptive management emphasizes flexible policies capable of changing in response to new conditions and problems (Tompkins and Adger 2004). Key here are flexible governance arrangement that creates opportunities for organizational learning and participatory project monitoring techniques such as focus groups or workshops (Armitage et al. 2009; Djalante et al. 2011).

These two examples help us identify a key shift in the biopolitical problematic of resilience. Whereas vulnerability approaches attempt to bring practice in line with policy, resilience enables *both* policy and practice to change in response to an unstable milieu. Adaptive co-management techniques enable practitioners to constantly and reflexively adapt their plans to whatever surprises may arise (Pelling 2010; Sotarauta and Srinivas 2006). Participatory approaches, in turn, allow practitioners to constantly work on and modify adaptive capacities in desirable ways. Together, these techniques enable resilience to realize the liberal will to truth that underpins applied approaches to hazard studies (on this will to truth, see Hewitt 1983; Grove 2013a). Discussing the benefits of adaptive management, Kai Lee suggests that,

> Adaptive management recapitulates the promise that Francis Bacon articulated four centuries ago: to control nature one must understand her [sic]. Only now, what we wish to control is not the natural world but a mixed system in which humans play a large, sometimes dominant role. Adaptive management is therefore experimentation that affects social arrangements and how people live their lives. (Lee 1999: no pagination)

Because resilience thinking strikes at the heart of many modernist and positivist approaches to environmental management, proponents frequently read resilience as a progressive development in thought and practice (e.g., Boyd and Juhola 2009; Yamane 2009). However, a biopolitical analysis demonstrates how resilience opens the most intimate recesses of life – the affective relations between people and their environments – to governmental intervention. Resilience is a technique of cultural socio-ecological engineering that often produces a thoroughly depoliticized and depotentialized landscape of vulnerability, in which newly "resilient" peoples live with vulnerability rather than remake the world to remove the sources of their insecurity (Grove ; Reid 2012).

Conclusions

This article has drawn on Foucaldian understandings of biopolitics to review developments in climate change and disaster studies. It demonstrates how the emergence of vulnerability and resilience approaches enable power to operate on progressively more intimate levels in the name of securing life against an uncertain future. However, this is not meant to paint an exceedingly bleak picture of adaptation and resilience. Indeed, critical researchers both within and outside the fields of climate change and disaster studies have begun exploring ways to combat the depoliticization of resilience and vulnerability. For instance, critical

disaster scholars offer incisive critiques of resilience for shifting institutional attention and resources away from vulnerability reduction programs that address the root causes of vulnerability (Cannon and Mueller-Mann 2010; Gaillard 2010; Manuel-Navarrete et al. 2011). In a different vein, critical scholars in political geography and security studies have begun drawing on Deleuzian and post-humanist theories of affect, materiality, and assemblage to unpack the myriad ways "life," as the lively materiality of both humans and non-humans, constantly exceeds and confounds resilience programming's attempts to govern uncertain futures. Scenario exercises are disrupted by power point slides that refuse to work (Adey and Anderson 2012), critical infrastructure security plans are confounded by rust that corrodes unexpectedly (Aradau 2010), and underdeveloped populations targeted by resilience programming subversively utilize resilience discourses to advance their own visions of sustainability and security (Grove 2013c).

The excess of life constitutes a vital field of study, for exploring power's failures in the face of life can identify points of transgression, where critical scholars and practitioners may begin to reconfigure the techniques and rationalities of climate change adaptation and disaster management towards more radical aims. What hangs in the balance are the possibilities for an affirmative biopolitics of adaptation: a politics of life organized around security *from* rather than *for* neoliberal order. To use Melinda Cooper's (2006) provocative turn of phrase, an affirmative biopolitics "sabotages the future" by subverting the efforts of institutionalized resilience and vulnerability programming to create systemic security against socio-ecological uncertainty (see also Hannah 2011). This biopolitics mobilizes the techniques and rationalities of vulnerability, adaptation, and resilience to alleviate actually existing insecurities produced by neoliberal development, without falling prey to the instrumentalism of many systems-oriented approaches that simply secure existing political economic order against the effects of climate change.

Short Biography

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Note

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