



Resilience thinking meets social theory: Situating social change in socio-ecological systems (SES) research

Progress in Human Geography
36(4) 475–489

© The Author(s) 2012

Reprints and permission:

sagepub.co.uk/journalsPermissions.nav

10.1177/0309132511425708

phg.sagepub.com



Muriel Cote
Andrea J. Nightingale

University of Edinburgh, UK

Abstract

The concept of resilience in ecology has been expanded into a framework to analyse human-environment dynamics. The extension of resilience notions to society has important limits, particularly its conceptualization of social change. The paper argues that this stems from the lack of attention to normative and epistemological issues underlying the notion of ‘social resilience’. We suggest that critically examining the role of knowledge at the intersections between social and environmental dynamics helps to address normative questions and to capture how power and competing value systems are not external to, but rather integral to the development and functioning of SES.

Keywords

environmental change, human-environment, knowledge, power, resilience, social theory

1 Introduction

The global scale and complexity of environmental change has triggered attempts to understand the relationships between social and ecological processes across a range of scholarly disciplines. One outcome of such interdisciplinary work is the popular concept of ‘resilience’, which, at its most basic, refers to the ability of socio-ecological systems (SES) to absorb disturbance without flipping into another state or phase (Gunderson, 2000). Resilience thinking proposes a systems approach to human-environment relations that fits well with attempts to predict or model social-ecological change. However, it has mainly evolved through the application of ecological concepts to society, problematically assuming that social and ecological system dynamics are

essentially similar. Many attempts at clarifying the meanings of resilience and associated notions, such as adaptive capacity and transformability, have stemmed from this issue (e.g. Brand and Jax, 2007; Folke et al., 2010). Yet more profound epistemological and ontological issues remain to be clearly addressed (Leach, 2008), including the tensions between a systems framework epistemology and normative questions such as ‘resilience of what and for whom?’ This paper proposes to take up this task by moving beyond semantic concerns to critically examine the use

Corresponding author:

Muriel Cote, University of Edinburgh, Drummond Street, Edinburgh, EH9 8XP, UK

Email: m.cote@sms.ed.ac.uk

of a shared epistemology for understanding and appraising the resilience of coupled social and ecological systems. Questioning this approach through a social theoretical lens helps to shed light on a number of inconsistencies in the way SES research engages with normative issues.

Resilience thinking has grown in remarkable isolation from critical social science literature on the human dimensions of environmental change considering overlaps in research interests. This is both a symptom of and a result of the lack of attention to processes of social and political change in adaptive dynamics. Yet political ecology and related approaches that focus on coping mechanisms for environmental change and climate variability have shown that an examination of sociocultural contexts and power helps capture underlying heterogeneities across different social-ecological systems dynamics (Blaikie et al., 1994; O'Brien et al., 2007; Ribot, 2010). Our purpose here is to bring together these issues with the insights of resilience research as a heuristic for thinking about environmental-social dynamics. We aim to make a case for situating resilience research and propose an alternative focus to 'social resilience', arguing that while resilience thinking is a useful heuristic, a shift in conceptualizing normative issues is required to include the dynamics of social change in definitions and analyses of resilience in SES research. More specifically, we suggest ways in which critical examinations of the role of knowledge at the intersections between social and environmental dynamics help to address normative questions and to capture how power and competing value systems are not external to, but rather integral to the development and functioning of SES.

This paper begins by drawing out the innovative and promising aspects of resilience thinking in nature-society research. Second, we unpack the normative assumptions and epistemological tensions that underlie the notion of SES, particularly with regard to its conceptualization of resilient social institutional dynamics. The third

section outlines fundamental questions and avenues for situating SES research in specific contexts. The final section draws on social theoretical and resilience approaches to knowledge at the interface of social and ecological dynamics to demonstrate the added value of addressing normative questions in resilience research.

II Resilience thinking: bringing social and ecological science together

Resilience thinking emerged directly out of dissatisfaction with models of ecosystem dynamics in ecological science in the 1970s. These older models relied on the assumption of the 'balance of nature', whereby biophysical dynamics tend towards stable equilibrium cycles, within which a single 'climax' can be reached (Clements, 1936). Resilience, on the other hand, is closely related to 'new ecology' that proposes ecosystem dynamics should be understood as revolving around multiple stable states (Botkin, 1990; Conway, 1987; Pimm, 1991). This idea stemmed from observations that variability, disturbance and unpredictability are not exceptions that ecological dynamics strive to redress, but rather are the underlying rules for bio-physical dynamics (Holling, 1987). In this sense, ecological resilience is not understood as the amount of time that systems take to return to an initial stable state, but the capacity of systems to absorb disturbance while retaining the same populations or state variables (Holling, 1973: 14).

Interest in this approach increased in the 1990s promoted by the Beijer Institute in Stockholm where a Resilience Alliance was created to identify possible connections between the work of C.S. Holling in ecological modelling and social science, particularly ecological economics (Anderies et al., 2004; Ludwig et al., 1997; Perrings, 2006). The aim in this revitalized resilience thinking was to develop a more

formal analytical framework that emphasized interactive dynamics between social and ecological systems. Drawing on theories about the co-evolutionary nature of human and biophysical systems (Norgaard, 1994), the concept of social-ecological system (SES) was developed. A resilience approach to components and dynamics of SES was further elaborated in a couple of edited volumes combining theoretical and empirical work by experts reaching from ecological, economic and social sciences (Berkes and Folke, 1998; Berkes et al., 2003).

Fundamentally within this work, human-environment relations are not conceived as separate systems with conflicting objectives and trajectories. Rather, the emphasis on feedback dynamics between social and ecological systems encourages the view that these cannot be conceived in isolation, as human systems are a component of, and in turn shape, ecological ones. One promising aspect of this work is the genuine commitment to a holistic approach that integrates a diversity of scholarly disciplines and embraces complexity. For example, resilience scholars consider that local ecological knowledge constitutes a key analytical domain of SES research (Berkes and Folke, 1998; Folke, 2006). It is argued that lay observations and knowledge about ecological change initiate transformations in the institutions related to the management of resources, which in turn modify the ways resources are used and thereby the landscape itself (Gadgil et al., 2003). For example, in the context of local resource management practices of Iraqw'ar Da/aw people in Tanzania, Tengo and Hammer (2003) show that Iraqw farmers' knowledge and understanding of environmental disturbance (e.g. flood, pest, drought) has led to the development of land-management practices, such as the mixing of land uses and crop types, which help maintain the value of the agro-ecosystem for farmers despite disturbance. Studies such as this one help substantiate arguments about local knowledge by resilience scholars and propose a

valuable intellectual platform for embracing complexity in human-environment relations across a diversity of disciplinary interest and expertise. Indeed, it also coincides with growing attention to indigenous knowledge in studies of the human dimensions of environmental change, not only as an object of study but also as a tool for scientific inquiry (Fairhead and Leach, 1996; Fortmann, 2008; Pretty et al., 1995).

Another innovative aspect of resilience thinking lies in the emphasis on the fundamental role of adaptive capacity in the analysis of human-environment relations. The concept of SES is based on the idea that adaptive dynamics are an inherent property of SES. Drawing on studies of resilience in ecological dynamics and on ecological economics, a meta-model termed 'panarchy' is proposed to represent idealized SES structures and functions in SES adaptive dynamics (Gunderson and Holling, 2002). It is argued that:

coupled socio-ecological systems (SES) grow, adapt, transform and collapse, at different scales – the stages of adaptation and collapse are not viewed as alternative routes but rather as part of a cycle that is driven by fast and slow, small and big events that can cascade up the scales. (Lambin, 2005: 177)

So the emphasis is on the importance of internal change, and more specifically on the unpredictability of change, thus encouraging an approach to SES dynamics in terms of the ability of their components to allow change to happen and adapt, rather than to control or avoid it (Berkes et al., 2003).

The approach draws on 'disequilibrium ecology', notions of threshold effects, and feedback mechanisms whereby a system can undergo fundamental changes in its functional characteristics, and flip into a different domain of attraction. In other words, it is assumed that some level of stability is achieved unless the disturbance is sufficient to cause a major phase shift (Gunderson, 2003; Holling, 1973).

However, the stability of SES is conceptualized as a moving baseline made up of multiple states rather than a static pit in which systems strive to remain.

This framework of SES dynamics has important potential as a 'counter-narrative' to conventional human-environment analyses that emphasize principles of 'maximum sustainable yields' and 'carrying capacity'. These approaches conceptualize change and surprise as exceptions and therefore 'noise' that must be analytically suppressed, and the role of 'good' natural management institutions is to 'command and control' disturbance to return to an initial stable state. Although these principles have long been found inadequate (Noy-Meir, 1973; Reij et al., 1996) they continue to be in wide circulation in natural resource management research (Breman et al., 2001; Homer-Dixon and Blitt, 1998). Thus, resilience thinking plays an important heuristic role in shifting the focus away from the quantitative availability of *resources*, and towards the scope of available *response options*. Interestingly, this shift has important similarities with related work on the human dimensions of environmental change and variability (Broch-Due and Schroeder, 2000; Gausset et al., 2005; Mortimore, 2005), although these cannot be elaborated within the scope of this paper.

Resilience thinking is therefore appealing because it offers a dynamic and forward-looking approach to human-environment change. Its holistic perspective and the emphasis on unpredictability, change and complexity across scales create avenues for better integrated work across a diverse range of scientific work and with lay epistemologies. While it is therefore useful as a heuristic for thinking about human-environment dynamics, its applications as a stand-alone formal theoretical framework are more problematic (Folke et al., 2010). We find it inadequate in part because it repeats the weaknesses of earlier approaches in risk and hazard science that overemphasized the role of physical shocks and undertheorized that of political

economic factors in conceptualizing vulnerability (Watts, 1983).¹ In the following section we develop this point further, highlighting the epistemological tensions at the core of this issue, and pointing to the need for critical engagement with normative questions of social difference and inequality in SES research that focuses on governance and social institutional dynamics.

III Examining the notion of SES: normative questions

In the last 10 years, interest in extending theories and concepts of ecological resilience to SES resilience has boomed (Janssen, 2007), specifically giving rise to the concept of 'social resilience', defined as 'the ability of groups or communities to cope with external stresses and disturbances as a result of social, political, and environmental change' (Adger, 2000b: 347). According to this definition the notion of 'social resilience' is a descriptive concept that refers to the social factors that allow change to happen while retaining similar feedbacks and functions of the SES. However, analyses of social resilience that have focused on the comparative performance of different management regimes faced with social or ecological disturbance have also been used to determine which forms of environmental governance are best (Adger, 2000a; Tompkins and Adger, 2004). Thus, while SES frameworks are applied as a (meta)-model of social-ecological interactions (Adger, 2000a; Cumming et al., 2005; Holling, 1973), they are also used as a policy tool for social-ecological systems management, broadly gathered under the notion of adaptive governance (Anderies et al., 2004; Folke et al., 2002; Olsson et al., 2004).

However, the slippage from descriptive to prescriptive domains in social resilience analyses, particularly in research on governance, is risky if its treatment of social action is flawed. Walker et al. (2006), for example, point out that 'some system regimes may be considered

desirable by one segment of society and undesirable by another. In addition, some regimes that are considered undesirable can also be very resilient, e.g., harsh dictatorships and desertified regions of the Sahel' (p. 3). Indeed there are fundamental processes that underlie the tension between stability and change in social dynamics which must be elucidated before we start analysing what governance characteristics promote resilient SES. In this domain, the treatment of ecological and social dynamics with a single epistemology is an important challenge. More specifically, the reliance on ecological principles to analyse social dynamics has led to a kind of social analysis that hides the possibility to ask important questions about the role of power and culture in adaptive capacity, or to unpack normative questions such as 'resilience of what?' and 'for whom?' when applied to the social realm.

Within resilience and SES thinking, the recognition that a dichotomous view of nature and society is problematic has given way to a focus on feedbacks and on the symmetrical properties of 'ecosystems' and 'societies' (Low et al., 2003). The aim is to draw out the theoretical implications of using ecological resilience concepts, such as threshold effects, that refer to the structural and functional characteristics of ecosystems, from a social science perspective (Tompkins and Adger, 2004; Walker et al., 2006). Studies of social resilience draw on the panarchy model to identify structural governance related attributes (e.g. flexibility, diversity, cross-scale connectivity) that enhance the resilience of SES. Lebel et al. (2006), for example, find some empirical support for improved resilience in cases where participatory, deliberative, multilayered and accountable institutions govern natural resource use. In synthesizing their results, they note the limitations of analysing the trade-offs and management decision aspects of governance within narrowly framed models of social and environmental priorities. However, we argue this point should be central to problem

definition about the resilience of SES. Dynamics of adaptive (or any other kind of) governance is embedded in historic and place-specific cultural and political contingencies that render attention to design alone incomplete to understand the scope of social responses to change and disturbance (Blaikie, 1985; Cleaver and Franks, 2005; Fincher, 2007; Leach et al., 1999). Specifically, an understanding of resilient or vulnerable systems in terms of abstract structural properties masks the necessity to ask normative questions to analyse the adaptive capacity of social-ecological systems that involve different sets of stakeholders at various scales, with multiple approaches to resource valuation and leadership, and the heterogeneous social networks of relations that underlie and shape management practices.

This latter theme has been touched upon by resilience approaches to the crossing themes of vulnerability, climate adaptations and development interventions (Adger et al., 2005; Lemos et al., 2007; Nelson et al., 2007; O'Brien et al., 2007). For example, Adger et al. (2005) argue that issues of social inequality and legitimacy should be included in evaluating the adaptive capacity of institutional configurations. However, their approach to legitimacy and equity is essentially instrumental as they focus mainly on showing how these social factors ensure the functionality of institutional structures. In addition, these considerations are problematically based on the assumption that institutions which are inequitable and illegitimate 'undermine the potential for welfare gains in the future and ... have less chance of full implementation (Adger et al., 2005: 83). However, work in environment and development has shown that there can be trade-offs between equity and legitimacy where legitimacy emerges from the maintenance or enactment of highly hierarchical and exclusionary social relations (Agrawal, 2005).

Simply changing the 'rules of the game' into fairer and more just distributive institutions is

difficult; it may lead to violent opposition or co-optation by those who stand to lose from such institutional changes (Berry, 2009; Lund, 2007; Sikor and Lund, 2009). In some cases, introducing more participatory and inclusive management that draws on existing flexibility can initiate a kind of social and political change that exacerbates existing vulnerability or creates new ones (Chhatre, 2007; Ribot, 2009). Examples are countless among work on the impacts of participatory and decentralized natural management initiatives, which shows that far from giving greater rights and decision-making power to disadvantaged groups, these initiatives often create opportunities for further exclusion at different scales, the effects of which range from local elite capture to expanded territorial control by the state (Nelson and Agrawal, 2008; Peet and Watts, 2004; Peluso, 1996). Failure to recognize these processes undermines the relevance of a resilience approach to human-environment dynamics, and as a policy tool.

The overemphasis on the similarities between social and ecological dynamics in resilience thinking masks the necessity to include these normative factors to understand social change and governance issues within SES adaptive dynamics. Social resilience work focuses on the functionality of institutions and considers normative issues as outcomes of institutional designs or structures, thereby, and paradoxically, adopting a conservative approach to social change in nature/society dynamics. By contrast, we argue, along with others, that normative factors, including power relations and cultural values, are integral to social change and to the institutional dynamics that mediate human environment relations (Nightingale, 2003b; Parks and Roberts, 2010; Peet and Watts, 2004; Schroeder and Suryanata, 1996; Shove, 2010). In order to gain access to questions of resilience of what and for whom, greater efforts are required to include these factors – which do not lend themselves well to modelling – in framing the scope of possibilities available

to individuals, groups or societies to respond to change.

We argue that an epistemological shift is necessary to start integrating these factors in resilience thinking. In the following section, we draw lessons from a social theory critique of how institutions and governance at the interface of social and ecological dynamics are conceptualized in resilience analyses. We show that situating resilience analyses within the operation of power/knowledge relations in institutional dynamics opens up issues around values, but also about equity and justice, which allows us to formulate questions about which resilience outcomes are desirable, and whether and how they are privileged over others.

IV Towards a ‘situated’ resilience approach

In a recent paper, Adger et al. (2009) note that the limits to adaptation are often explained through the ecological, economic and technological limits of SES to the detriment of inherent contextual aspects of social systems that constrain adaptive mechanics. We argue together with them that analyses of the capacity to adapt to change must be framed within an understanding of cultural values, historical context and ethical standpoints of the kinds of actors involved. Yet the solutions proposed by Adger et al. (2009) and in similar work continue to be based on structure and function of institutions – getting the rules right. We argue, however, that to adequately capture adaptation limits requires an epistemological shift in conceptualizing nature/society relations, in particular through a move away from attention to institutional configurations alone, and towards the processes and relations that support these structures. Here, drawing from the extensive literature on political ecology and nature-society geographies provides tools for conceptualizing those dynamics (Elmhirst and Resurreccion, 2008; Forsyth, 2003; Nygren and Rikoon,

2008; Peet and Watts, 2004; Prudham, 2004; Shove, 2010; Sundberg, 2003; Swyngedouw, 2010; Turner and Robbins, 2008).

These approaches contrast with the kind of institutional economics and rational game theory that inform understandings of human action in social resilience research, which has been criticized for being too firmly rooted in a methodological individualistic approach to agency (Cleaver and Franks, 2005). Cleaver (2000: 363) argues that in institutional economics 'social norms are seen to occupy a secondary place to economic rationality' and 'social relations are explained as instrumental in securing access to particular resources'; whereas political ecology work on the management of common property resources has shown how institutions that govern resource use are 'partial, intermittent and indeed often invisible, being located in the daily interactions of ordinary lives' (Cleaver, 2000: 366). In other words, attention to the design of explicit use rules has limited explanatory power to understand patterns of resource extraction because the application of rules also varies according to the different contexts in which they are enacted (Leach et al., 1999; Peet and Watts, 2004).

In this sense, the conceptual framing used in analyses of social resilience has obscured the recursive dynamics at work between structural properties of a system, and decision-making processes and practices, because the emphasis has been on finding out the precedence of the former over the latter through causal relationships. The kinds of questions asked by resilience scholars are heavily influenced by a modelling 'culture' that is preoccupied with determining ecological outcomes, paying attention to the variety of social institutional factors that give rise to the depletion or conservation of resources (Adger et al., 2009; Berkes, 2002; Brown and Rosendo, 2000; Ostrom et al., 2007). On the other hand, social scientists have argued that the extent to which ecological outcomes constitute a problem is a product of politicized,

social-cultural processes, emphasizing the positionality and subjectivities of actors involved (Castree, 2001; Ribot, 2010; Warren, 2002). As such, we advocate to situate our inquiries – resilience cannot be 'seen from nowhere' (Haraway, 1991) – based on the recognition that power operates in and through socio-environmental systems in ways that link together the social and environmental at conceptual as well as empirical levels.

A reconciliation of pragmatist and constructivist methodological arguments may be elaborated by opening up the range of outcomes assessed in such a way that it is not only the impacts of certain institutional designs that are investigated, but also the nested political and social processes that give rise to the production and reproduction of these designs. For example, much would be gained from investigating the kinds of cultural commitments and political relations that underlie the persistence of certain policy framings that are locked into equilibrium views and individualistic logics of many environmental and development policies. However, this is not simply a case of 'adding' cultural and historical factors in feedback models. Along with others (Leach, 2008) we suggest an engagement with social theories about structure/agency as a way to formulate questions that were previously invisible from a systems theory standpoint. From this, knowledge and institutions emerge as central conceptual anchor points for including the role of power and culture in adaptation dynamics.

Fundamentally, situating resilience research requires moving away from an inference approach whereby abstract institutional criteria (such as flexibility, diversity, connectivity) are determined in advanced and tested on the ground. Rather, principles of resilience must be drawn out of situated systems where socio-cultural issues and social relations of power mediating environmental decision-making are observable (Berry, 2009; Lund, 2006; Peters, 2006). An engagement with these issues means that the questions that need to be asked include

the following.² Does the resilience of some livelihoods result in the vulnerability of others? Do specific social institutional processes that encourage social inequalities have implications for the resilience of these groups? These questions help to bring normative issues to the centre of our analyses, and emphasize the political dimensions of response options available to different actors. Such problem formulation is central to analyses of adaptation strategies and their theorization must be integral to the kind of approach to SES that resilience thinking offers. In the last section of this paper, we offer an illustration for this methodological argument by contrasting a conventional and a 'situated' resilience approach to the role of knowledge in SES research.

V Situated knowledge in SES dynamics: resilience in context

In resilience thinking, questions about uncertainty and indeterminacy in human-environment dynamics extend beyond empirical results to also encompass the limits of scientific knowledge – the technical limitations of science and the inherent unpredictability of future conditions (Holling, 1993: 553). This openness to unknowability in resilience thinking has been crucial for creating legitimate space for the incorporation of other types of knowledge into scientific inquiry.

Reflecting the influence of common property theory (Ostrom, 1990) and the empirical focus on rural contexts, it is argued that the unique vantage point of indigenous peoples long established in specific geographical spaces makes their observations and knowledge (content and categories) of environmental processes invaluable for the scientific inquiries about response options to change (Berkes and Folke, 1998; Berkes et al., 2003). This is particularly useful in places where long-term data are lacking, or where experiments cannot be replicated and the generalizability of results is limited (Chalmers and Fabricius, 2007). By emphasizing the

limitations of science both in terms of the implications of uncertainty and problems related to scientific measurement, resilience scholars suggest that openness to lay knowledge is as good a way as any to acquire information about environmental processes; better still, it can draw attention to certain variables previously overlooked by scientific knowledge, in particular those pertaining to the socio-environmental nexus.

However, long-standing concerns remain in environmental social science disciplines about the epistemological conflict between scientific and indigenous knowledge, although these concerns have been neglected in resilience scholarship. It has been argued that overarching rules about appropriate integration of scientific and indigenous knowledge are not relevant because the dichotomy is only problematic depending on the context (Agrawal, 1995; Fernandez-Gimenez et al., 2006; Füssel, 2007). The question of whether knowledge is a process (Haraway, 1991; Longino, 1990) or a 'thing' that can be captured and stored (cf. Agrawal, 1995) is at the centre of this debate. We argue that when knowledge is conceptualized as process, performed in the everyday (Niemeijer and Mazzucato, 2003; Nightingale, 2003a, 2005), it brings it fundamentally into conflict with current efforts to insert some form of homogenized, uniform 'indigenous knowledge' into social ecological systems. If knowledge cannot be divorced from its context without fundamentally changing it (Agrawal, 1995), then seeking to 'discover' and 'use' indigenous knowledge as a static 'thing' within resilience studies leads to a problematic instrumentalization of such knowledge. The goal in conventional resilience research seems to be to get the *facts* right so they can be inserted into a (modelled) system. On the other hand, situating resilience problem formulations in *contestations over* knowledge brings to the fore questions about whose resilience we are concerned with, and to what end.

More specifically, we want to challenge the focus in social analyses of resilience on how the

content of knowledge influences the elaboration of 'rules in use'. We argue instead that decision-making processes cannot be usefully understood by decontextualizing knowledge in such a way. Theories of structure and agency point to the fact that while the content, or 'information', of knowledge orients decision-making, the context of knowledge production crucially frames the scope of human action (Bourdieu, 1977). If knowledge is multidimensional and processual, culture, world-views and axes of social differentiation such as gender, class and race are crucial starting points to understand the positions from which actors become enrolled in decision-making processes.³ These kinds of positionings give rise to multiple rationalities whereby the interrelation of structure, knowledge and agency takes shape (Cleaver and Franks, 2005; Larson and Soto, 2008; Nightingale, 2011a; Sending and Neumann, 2006). Indeed the latter begs us to unpack the normative assumptions underlying resilience of/for social systems: who defines what states/thresholds are desirable, and for whom?

For example, in a recent study, Nielsen and Reenberg (2009) explored why there are differences in preferred resource management strategies for adaptation to declining soil fertility between Rimaybe and Fulbe groups, two ethnically differentiated agropastoralist groups, in northern Burkina Faso. One important adaptation strategy to the decrease of cereal yields in the region is the *zai*, a farming technique elaborated in the central part of the country and later disseminated more widely through participatory Soil and Water Conservation (SWC) projects. They find that despite the widely acclaimed results of the *zai* technique, Fulbe groups tend not to practise it, compared to neighbouring Rimaybe groups. Nielsen and Reenberg pointed out that because the former have a stronger pastoralist identity they place less importance on resolving problems related to farming, and pay little attention to *zai* as a farming option. Here it is not so much the content of knowledge that

shapes decision-making but the conditions of its production; world-views and ethnic differentiation intersect in the emergence of adaptive decision-making.

This point brings us to the final element of a situated resilience approach. Knowledge collides with power structures when we try to understand 'the right way of doing things'. In the same study, Nielsen and Reenberg (2009) show that the Fulbe cultural commitment to living in the bush on the outskirts of villages means that they tend not to get involved in participatory SWC projects. This process of marginalization comes both from the fact that SWC projects privilege sedentary villages as administrative sites to coordinate their initiative, and from the culturally determined suspicion of Fulbe towards 'village affairs' which they normally have limited power over. The neglect of *zai* as a response to decreasing soil fertility does not emerge from specific rules informed by environmental knowledge. Rather, relations of power between socially differentiated groups and their cultural representations help illuminate the processes through which individuals and groups come to understand their scope of response options and to act in relation to socio-ecological change (Agrawal, 2005; Harris, 2006).

We want to make it clear, however, that easy identification of decisions that can be seen as 'rational' within a particular cultural framework (as in this case) are not always possible. Work in environment and development has shown resource management contexts to be potent forums where domination is contested and reinforced (Gururani, 2002; Neumann, 2004; Nightingale, 2005; Sundberg, 2004). The exercise of power and culture emerges out of the performance of everyday identities and subjectivities⁴ (Butler, 1997). Central to this approach is the need to go beyond an emphasis on 'rules' and institutional designs that reflect logics of economic maximization, and to broaden our consideration to subjective identities and affective

relationships, through gender, class and ethnicity, for example, that shed light on the role of multiple, complex and contested rationalities in ecological decision-making processes. But such a broadening is not simply a case of adding in the ‘irrational’; it requires a more fundamental shift in how knowledge is understood to operate (Nightingale, 2011b) and the consequences of this for the kinds of questions we formulate prior to our analyses of socio-ecological systems. Human adaptation to change emerges from heterogeneous processes that must be understood through the recursive relationship between knowledge, agency and context as mediated by power, culture and history.

VI Conclusion

What are the implications of this discussion for advancing research into the social dimensions of resilience? First, we want to reiterate the important contributions of resilience thinking for bringing together scholars with a common interest in addressing environmental change. This has been a vital step towards engagement with the ‘messy’ nature of social systems, highlighting the importance of multiscale interactions driving change, and acknowledging unpredictability inherent to socio-environmental change. Second, resilience thinking has been a crucial middle ground between social and environmental science, but also between science and policy, opening up space for engagement with indigenous and other knowledges that can significantly enhance our understanding of social environmental challenges.

As such, resilience thinking is a body of thought worth developing and extending. Yet, as we have argued above, resilience approaches (and the field of sustainability science more widely) need to engage with the insights and critiques from the social sciences about agency, power and knowledge. When power and knowledge are conceptualized as dynamic and situated processes – inherent to socio-environmental

systems rather than externalities that need to be controlled – and agency distanced from self-determining, rational actors, the focus of empirical investigations and theoretical development shifts to political and ethical questions as crucial drivers of social-ecological outcomes rather than ‘inconvenient’ politics that can be simply sorted out through institutional design.

We suggest that a key reason why the conceptualization of social change in SES research is so problematic is in part because it allows too much focus on the structures and ‘functionality’ of an institutional system, devoid of political, historical and cultural meaning. Greater efforts at situating definitions and question formulation about resilience within political and cultural heterogeneities helps address both this issue and underlying normative concerns. As an example, we illustrate how shifting our empirical focus away from the content of knowledge and towards the context of its production helps capture multiple rationalities and the role of power imbalances in adaptive dynamics. Our aim is to show that a move away from the inference of abstract criteria such as flexibility and diversity, and towards situated systems and the cultural and political categories of specific contexts, helps capture more realistically the scope of options available to specific SES to respond to change and variability.

As a concluding comment, we want to point out that situating resilience has important political implications with regard to overlapping descriptive and prescriptive applications of resilience thinking. Like other sustainability approaches, the latter is not only a framework advancing scientific knowledge about human-environment dynamics, but it also provides tools to orient the governance of SES. However, when we tread into the domain of what ‘ought’ to be, we have moved firmly out of the science of description and prediction as it is understood today and into moral and ethical terrain. In this sense resilience thinking is a power-laden framing that creates certain windows of visibility on

the processes of change, while obscuring others. Situating empirical studies of SES dynamics, as elaborated in this paper, draws our attention onto such issues of power, authority and complex rationalities, which allows us to ask difficult questions about whose environments and livelihoods we seek to protect and why. Only by placing these concerns in the centre of our analysis can we begin to address issues such as ‘resilience for whom and at what cost to which others?’.

Funding

The research on which this paper is based was funded by an ESRC PhD studentship supplemented by support from Derek and Maureen Moss via the Moss Centenary Research Fund.

Notes

1. We are grateful to one reviewer for helping us articulate this point. See also the interesting comments in Turner (2010) about a critical engagement with resilience from a political ecological perspective.
2. We are grateful to William M. Adams for helping us to articulate these questions more clearly.
3. Here we want to make it clear that ‘gender’, ‘race’ or ‘class’ positions should not be used as proxies for understanding subjectivity. Rather, such identities provide a starting point from which to understand how people become enrolled in particular kinds of SES.
4. Subjectivity is often conflated with identity, but it is important to distinguish between a conception of the subject and the identities people embrace and enact. The subject is constituted by power, both power over and the power to act, and often refers to the discursive ways in which people become subjects of states or other types of authority (A. Allen, 2002; J. Allen, 1999; Butler, 1990, 1997; Foucault, 1995) The concept of subjectivity is also used to understand the operation of power in society more generally (Butler, 1997; Mahoney and Yngvesson, 1992; Probyn, 2003). Feminist theorists often refer to the ways in which people are ‘hailed by’ or subjected by, for example, gender and race, which, while they may resist, they find very difficult to escape (Bondi and Davidson, 2003; Gibson, 2001; Longhurst, 2003; Probyn, 2003).

References

- Adger WN (2000a) Institutional adaptation to environmental risk under the transition in Vietnam. *Annals of the Association of American Geographers* 90: 738–758.
- Adger WN (2000b) Social and ecological resilience: Are they related? *Progress in Human Geography* 24: 347–364.
- Adger WN, Arnell NW, and Tompkins EL (2005) Adapting to climate change: Perspectives across scales. *Global Environmental Change* 15: 77–86.
- Adger WN, Dessai S, Goulden M, Hulme M, Lorenzoni I, Nelson DR, et al. (2009) Are there social limits to adaptation to climate change? *Climatic Change* 93: 335–354.
- Agrawal A (1995) Dismantling the divide between indigenous and scientific knowledge. *Development and Change* 26: 413–439.
- Agrawal A (2005) *Environmentality*. Durham, NC: Duke University Press.
- Allen A (2002) Power, subjectivity, and agency: Between Arendt and Foucault. *International Journal of Philosophical Studies* 10: 131–149.
- Allen J (1999) Spatial assemblages of power: From domination to empowerment. In: Massey D, Allen J, and Sarre P (eds) *Human Geography Today*. Cambridge, Polity Press, 194–218.
- Anderies JM, Janssen MA, and Ostrom E (2004) A framework to analyze the robustness of social-ecological systems from an institutional perspective. *Ecology and Society* 9: Article 18.
- Berkes F (2002) Cross-scale institutional linkages: Perspectives from the bottom-up. In: Ostrom E, Dietz T, Dolsak N, Stern PC, Stonich S, and Webe EU (eds) *The Drama of the Commons*. Washington, DC: National Academy Press, 293–322.
- Berkes F and Folke C (1998) Linking social and ecological systems for resilience and sustainability. In: Berkes F and Folke C (eds) *Linking Social and Ecological Systems: Management Practices and Social Mechanisms for Building Resilience*. Cambridge: Cambridge University Press, 1–25.
- Berkes F, Colding J, and Folke C (eds) (2003) *Navigating Social-Ecological Systems: Building Resilience for Complexity and Change*. Cambridge: Cambridge University Press.
- Berry S (2009) Property, authority and citizenship: Land claims, politics and the dynamics of social division in West Africa. *Development and Change* 40(1): 23–45.

- Blaikie P (1985) *The Political Economy of Soil Erosion in Developing Countries*. New York, Longman.
- Blaikie P, Cannon T, Davies I, and Wisner B (1994) *At Risk: Natural Hazards, People's Vulnerability and Disaster*. London: Routledge.
- Bondi L and Davidson J (2003) Troubling the place of gender. In: Anderson K, Domosh M, Pile S, and Thrift N (eds) *Handbook of Cultural Geography*. London: SAGE, 325–344.
- Botkin DB (1990) *Discordant Harmonies: A New Ecology for the Twenty-first Century*. New York: Oxford University Press.
- Bourdieu P (1977) *Outline of a Theory of Practice*. Cambridge: Cambridge University Press.
- Brand FS and Jax K (2007) Focusing the meaning(s) of resilience: Resilience as a descriptive concept and boundary object. *Ecology and Society* 12: Article 23.
- Breman H, Groot JJR, and Van Keulen H (2001) Resource limitations in Sahelian agriculture. *Global Environmental Change* 11: 59–68.
- Broch-Due V and Schroeder RA (eds) (2000) *Producing Nature and Poverty in Africa*. Stockholm: Nordiska Afrikainstitutet.
- Brown K and Rosendo S (2000) The institutional architecture of extractive reserves in Rondônia, Brazil. *The Geographical Journal* 166: 35–48.
- Butler J (1990) *Gender Trouble: Feminism and the Subversion of Identity*. New York: Routledge.
- Butler J (1997) *The Psychic Life of Power*. Stanford, CA: Stanford University Press.
- Castree N (2001) Socializing nature: Theory, practice, and politics. In: Castree N and Braun B (eds) *Social Nature: Theory, Practice and Politics*. Oxford: Blackwell, 1–21.
- Chalmers N and Fabricius C (2007) Expert and generalist local knowledge about land-cover change on South Africa's wild coast: Can local ecological knowledge add value to science? *Ecology and Society* 12: Article 10.
- Chhatre A (2007) Accountability in decentralization and the democratic context: Theory and evidence from India. *Representation, Equity and Environment Working Paper Series*, Working Paper 23 (January): 1–24.
- Cleaver F (2000) Moral ecological rationality: Institutions and the management of common property resources. *Development and Change* 31: 361–383.
- Cleaver F and Franks T (2005) How institutions elude design: River basin management and sustainable livelihoods. Research Paper 12. Bradford Centre for International Development, University of Bradford.
- Clements F (1936) Nature and structure of the climax. *Journal of Ecology* 24: 252–284.
- Conway GR (1987) The properties of agro-ecosystems. *Agricultural Systems* 24: 95–117.
- Cumming GS, Barnes G, Perz S, Schmink M, Sieving KE, Southworth J, et al. (2005) An exploratory framework for the empirical measurement of resilience. *Ecosystems* 8: 975–987.
- Elmhirst R and Resurreccion BP (2008) Gender, environment and natural resource management: New dimensions, new debates. In: Resurreccion BP and Elmhirst R *Gender and Natural Resource Management: Livelihoods, Mobility and Interventions*. London: Earthscan, 3–22.
- Fairhead J and Leach M (1996) *Misreading the African Landscape*. Cambridge: Cambridge University Press.
- Fernandez-Gimenez ME, Huntington HP, and Frost KJ (2006) Integration or co-optation? Traditional knowledge and science in the Alaska Beluga Whale Committee. *Environmental Conservation* 33: 306–315.
- Fincher R (2007) Space, gender and institutions in processes creating difference. *Gender, Place and Culture* 14: 5–27.
- Folke C (2006) Resilience: The emergence of a perspective for social-ecological systems analyses. *Global Environmental Change* 16: 253–267.
- Folke C, Carpenter S, Elmqvist T, Gunderson L, Holling C, Walker B, et al. (2002) Resilience and sustainable development: Building adaptive capacity in a world of transformations. Scientific Background Paper on Resilience for the process of The World Summit on Sustainable Development on behalf of The Environmental Advisory Council to the Swedish Government, Stockholm.
- Folke C, Carpenter SR, Walker B, Scheffer M, Chapin T, and Rockström J (2010) Resilience thinking: Integrating resilience, adaptability and transformability. *Ecology and Society* 15(4): Article 20.
- Forsyth T (2003) *Critical Political Ecology*. London: Routledge.
- Fortmann L (ed.) (2008) *Participatory Research in Conservation and Rural Livelihoods*. Chichester: Wiley.
- Foucault M (1995) *Discipline and Punish*. New York: Vintage Books.
- Füssel H-M (2007) Vulnerability: A generally applicable conceptual framework for climate change research. *Global Environmental Change* 17: 155–167.

- Gadgil M, Olsson P, Berkes F, and Folke C (2003) Exploring the role of ecological knowledge in ecosystem management: Three case studies. In: Berkes F, Colding J, and Folke C (eds) *Navigating Social-Ecological Systems: Building Resilience for Complexity and Change*. Cambridge: Cambridge University Press, 189–209.
- Gausset Q, Whyte MA, and Birch-Thomsen T (2005) *Beyond Territory and Scarcity*. Stockholm: Nordiska Afrikainstitutet.
- Gibson K (2001) Regional subjection and becoming. *Environment and Planning D: Society and Space* 19: 639–667.
- Gunderson LH (2000) Ecological resilience – in theory and application. *Annual Review of Ecology and Systematics* 31: 425–439.
- Gunderson LH (2003) Adaptive dancing: Interactions between social resilience and ecological crises. In: Berkes F, Colding J, and Folke C (eds) *Navigating Social-Ecological Systems: Building Resilience for Complexity and Change*. Cambridge: Cambridge University Press, 33–52.
- Gunderson LH and Holling C (eds) (2002) *Panarchy: Understanding Transformations in Human and Natural Systems*, Washington, DC: Island Press.
- Gururani S (2002) Forests of pleasure and pain: Gendered practices of labor and livelihood in the forests of Kumaon Himalayas, India. *Gender, Place and Culture* 9: 229–243.
- Haraway D (1991) *Simians, Cyborgs and Women*. New York: Routledge.
- Harris L (2006) Irrigation, gender, and social geographies of the changing waterscapes of southeastern Anatolia. *Environment and Planning D: Society and Space* 24: 187–213.
- Holling CS (1973) Resilience and stability of ecological systems. *Annual Review of Ecology and Systematics* 4: 1–24.
- Holling CS (1987) Simplifying the complex: The paradigms of ecological function and structure. *European Journal of Operational Research* 30: 139–146.
- Holling CS (1993) Investing in research for sustainability. *Ecological Applications* 3: 552–555.
- Homer-Dixon TF and Blitt J (eds) (1998) *Ecoviolence: Links among Environment, Population and Security*. Lanham, MD: Rowman and Littlefield.
- Janssen MA (2007) An update on the scholarly networks on resilience, vulnerability and adaptation within the human dimensions of global environmental change. *Ecology and Society* 12(2): 9.
- Lambin EF (2005) Conditions for sustainability of human-environment systems: Information, motivation, and capacity. *Global Environmental Change* 15: 177–180.
- Larson AM and Soto F (2008). Decentralization of natural resource governance regimes. *Annual Review of Environment and Resources* 33(1): 213–239.
- Leach M (2008) Re-framing resilience: A symposium report. *STEPS Working Paper 13*. Brighton: STEPS Centre.
- Leach M, Mearns R, and Scoones I (1999) Environmental entitlements: Dynamics and institutions in community-based natural resource management. *World Development* 27: 225–247.
- Lebel L, Anderies JM, Campbell B, Folke C, Hatfield-Dodds S, Hughes TP, et al. (2006) Governance and the capacity to manage resilience in regional social-ecological systems. *Ecology and Society* 11: Article 19.
- Lemos MC, Boyd E, Tompkins EL, Osbahr H, and Liverman D (2007) Developing adaptation and adapting development. *Ecology and Society* 12: Article 26.
- Longhurst R (2003) Introduction: Placing subjectivities, spaces and places. In: Anderson K, Domosh M, Pile S, and Thrift N (eds) *Handbook of Cultural Geography*. London: SAGE, 282–289.
- Longino HE (1990) *Science as Social Knowledge: Values and Objectivity in Scientific Inquiry*. Princeton, NJ: Princeton University Press.
- Low B, Ostrom E, Simon C, and Wilson J (2003) Redundancy and diversity: Do they influence optimal management? In: Berkes F, Colding J, and Folke C (eds) *Navigating Social-Ecological Systems: Building Resilience for Complexity and Change*. Cambridge: Cambridge University Press, 83–114.
- Ludwig D, Walker B, and Holling CS (1997) Sustainability, stability, and resilience. *Conservation Ecology* 1: Article 7.
- Lund C (2006) Twilight institutions: Public authority and local politics. *Development and Change* 37(4): 685–705.
- Lund C (ed.) (2007) *Twilight Institutions: Public Authority and Local Politics in Africa*. Oxford: Blackwell.
- Mahoney MA and Yngvesson B (1992) The construction of subjectivity and the paradox of resistance: Reintegrating feminist anthropology and psychology. *Signs* 18: 44–73.
- Mortimore M (2005) Social resilience in African dryland livelihoods: Deriving lessons for policy. In: Gausset Q,

- Whyte MA, and Birch-Thomsen T (eds) *Beyond Territory and Scarcity*. Stockholm, Nordiska Afrikainstitutet, 46–69.
- Nelson DR, Adger WN, and Brown K (2007) Adaptation to environmental change: Contributions of a resilience framework. *The Annual Review of Environment and Resources* 32: 395–419.
- Nelson F and Agrawal A (2008) Patronage or participation: Community based natural resource management reform in Sub-Saharan Africa. *Development and Change* 39(4): 557–585.
- Neumann RP (2004) Moral and discursive geographies in the war for biodiversity in Africa. *Political Geography* 23: 813–837.
- Nielsen JO and Reenberg A (2009) Cultural barriers to climate change adaptation: A case study from northern Burkina Faso. *Global Environmental Change* 1: 142–152.
- Niemeijer D and Mazzucato V (2003) Moving beyond indigenous soil taxonomies: Local theories of soils for sustainable development. *Geoderma* 111: 403–424.
- Nightingale AJ (2003a) A feminist in the forest: Situated knowledges and mixing methods in natural resource management. *ACME: an International E-Journal for Critical Geographers* 2: 77–90.
- Nightingale AJ (2003b) Nature-society and development: Cultural, social and ecological change in Nepal. *Geoforum* 34: 525–540.
- Nightingale AJ (2005) ‘The experts taught us all we know’: Professionalisation and knowledge in Nepalese community forestry. *Antipode* 34: 581–604.
- Nightingale AJ (2011a) Bounding difference: Intersectionality and the material production of gender, caste, class and environment in Nepal. *Geoforum* 42(2): 153–162.
- Nightingale AJ (2011b) Beyond design principles: Subjectivity, emotion and the (ir)rational commons. *Society and Natural Resources* 24(2): 119–132.
- Norgaard R (1994) *Progress Betrayed: The Demise of Development and a Co-Evolutionary Revisioning of the Future*. London: Routledge.
- Noy-Meir I (1973) Desert ecosystems: Environment and producers. *Annual Review of Ecological Systematics* 4: 25–51.
- Nygren A and Rikoon S (2008) Political ecology revisited: Integration of politics and ecology does matter. *Society and Natural Resources* 21(9): 767–782.
- O’Brien K, Eriksen S, Nygaard LP, and Schjolden A (2007) Why different interpretations of vulnerability matter in climate change discourses. *Climate Policy* 7: 73–88.
- Olsson P, Folke C, and Berkes F (2004) Adaptive co-management for building resilience of social-ecological systems. *Environmental Management* 34: 75–90.
- Ostrom E (1990) *Governing the Commons. The Evolution of Institutions for Collective Action*. Cambridge: Cambridge University Press.
- Ostrom E, Janssen MA, and Anderies JM (2007) Going beyond panaceas. *Proceedings of the National Academy of Science* 104: 15176–15178.
- Parks BC and Roberts JT (2010). Climate change, social theory and justice. *Theory, Culture and Society* 27(2–3): 134–166.
- Peet R and Watts M (2004) *Liberation Ecologies: Environment, Development and Social Movements*. London: Routledge.
- Peluso NL (1996) Fruit trees and family trees in an anthropogenic forest: Ethics of access, property zones, and environmental change in Indonesia. *Comparative Studies in Society and History* 38: 510–548.
- Perrings C (2006) Resilience and sustainable development. *Environment and Development Economics* 11: 417–427.
- Peters P (2006) Beyond embeddedness: A challenge raised by a comparison of the struggles over land in African and post-socialist countries. In: Benda-Beckmann FV, Benda-Beckmann KV, and Wiber M (eds) *Changing Properties of Property*. New York and Oxford, Berghahn Books, 84–105.
- Pimm SL (1991) *The Balance of Nature? Ecological Issues in the Conservation of Species and Communities*. Chicago: Chicago University Press.
- Pretty JN, Guijt I, Thompson J, and Scoones I (1995) *Participatory Learning and Action: A Trainer’s Guide*. London: IIED.
- Probyn E (2003) The spatial imperative of subjectivity. In: Anderson K, Domosh M, Pile S, and Thrift N (eds) *Handbook of Cultural Geography*. London: SAGE, 290–299.
- Prudham S (2004) *Knock on Wood: Nature as Commodity in Douglas Fir Country*. New York: Routledge.
- Reij C, Scoones I, and Toulmin C (eds) (1996) *Sustaining the Soil: Indigenous Soil and Water Conservation in Africa*. London: Earthscan.

- Ribot JC (2009) Authority over forests: Empowerment and subordination in Senegal's democratic decentralization. *Development and Change* 40(1): 105–129.
- Ribot JC (2010) Vulnerability does not just fall from the sky: Toward multi-scale pro-poor climate policy. In: Mearns R and Norton A (eds) *Social Dimensions of Climate Change: Equity and Vulnerability in a Warming World*. Washington, DC: The World Bank, 47–74.
- Schroeder RA and Suryanata K (1996) Gender, class power in agroforestry systems: Case studies from Indonesia and West Africa. In: Peet R and Watts M (eds) *Liberation Ecologies: Environment, Development, Social Movements*. New York: Routledge, 188–204.
- Sending OJ and Neumann IB (2006). Governance to governmentality: Analyzing NGOs, states, and power. *International Studies Quarterly* 50(3): 651–672.
- Shove E (2010). Social theory and climate change. *Theory, Culture and Society* 27(2–3): 277–288.
- Sikor T and Lund C (2009) Access and property: A question of power and authority. *Development and Change* 40(1): 1–22.
- Sundberg J (2003) Conservation and democratization: Constituting citizenship in the Maya Biosphere Reserve, Guatemala. *Political Geography* 22(7): 715–740.
- Sundberg J (2004) Identities in the making: Conservation, gender and race in the Maya Biosphere Reserve, Guatemala. *Gender, Place and Culture* 11: 43–66.
- Swyngedouw E (2010) Apocalypse Forever? *Theory, Culture and Society* 27(2–3): 213–232.
- Tengo M and Hammer M (2003) Management practices for building adaptive capacity: A case from northern Tanzania. In: Berkes F, Colding J, and Folke C (eds) *Navigating Social-Ecological Systems: Building Resilience for Complexity and Change* Cambridge: Cambridge University Press, 132–162.
- Tompkins EL and Adger WN (2004) Does adaptive management of natural resources enhance resilience to climate change? *Ecology and Society* 9: Article 10.
- Turner BL and Robbins P (2008) Land-change science and political ecology: Similarities, differences, and implications for sustainability science. *Annual Review of Environment and Resources* 33(1): 295–316.
- Turner M (2010) Climate change and social resilience: 'Adaptive' conflict in the Sahel. Paper prepared for the Berkeley Environmental Politics Workshop. Available at: http://globetrotter.berkeley.edu/bwep/colloquium/papers/Turner_ClimateChangeAndSocialResilience.pdf.
- Walker BH, Anderies JM, Kinzing AP, and Ryan P (2006) Exploring resilience in social-ecological systems through comparative studies and theory development: Introduction to the special issue. *Ecology and Society* 11: Article 12.
- Warren A (2002) Land degradation is contextual. *Land Degradation and Society* 13: 449–459.
- Watts M (1983) On the poverty of theory: Natural hazards research in context. In: Hewitt K (ed.) *Interpretations of Calamity*. London: Allen and Unwin, 231–262.