



Global environmental change I: A social turn for resilience?

Katrina Brown

University of Exeter, UK

Abstract

Resilience is everywhere in contemporary debates about global environmental change. The application of resilience concepts to social and ecological systems and dilemmas has been roundly critiqued for under-theorizing social dimensions, and human geographers particularly have been an important critical voice in highlighting the omission of social, political and cultural dynamics from different resilience literatures. Here I examine whether and how resilience theory and applications are addressing these shortcomings and incorporating these social and political dimensions. My premise is that within the emerging field of resilience there are many voices expressing multiple and often contested interpretations and meanings. The field is rapidly evolving and new ideas are being tested and introduced. Importantly, resilience is here to stay and is being widely taken up and applied in policy and practice. I review theoretical and empirical published research across fields of geography, environmental change, natural resource management, and international development, concentrating on new work since 2010. I examine three emerging topics: community resilience; transformations; and resilience as an organizing concept for radical change. I find that there is still relatively little analysis of social difference and resilience, and there are continuing tensions between normative and analytical stances on resilience. These characteristics are mirrored in policy discourses and local level actions on resilience.

Keywords

community resilience, social ecological systems, sustainability, transformation

I Introduction

In January 2013 *Time* magazine declared ‘resilience’ the buzzword of 2013 (Walsh, 2013). Indeed the past four years have seen a spectacular rise in the term applied in a wide range of academic, policy and popular media, especially applied to the field of global change generally, and global environmental change in particular. Resilience, it seems, is now everywhere, permeating scientific and popular debates. In the wake of a sudden event or disaster we witness calls for increased resilience, or narratives about how resilient people and communities are, or perhaps how resilient ecosystems are or nature itself is in the wake of disturbance. Resilience featured prominently in discussions

surrounding the Rio+ 20 conference on sustainable development in 2012, representing – perhaps – a new wave of thinking around sustainability, in an age of economic and political instability (see, for example, the United Nations Secretary-General’s High-level Panel on Global Sustainability ‘Resilient people, resilient planet: A future worth choosing’ report (2012) expounding the need to transform global economy, and the Montpellier Panel’s (2012)

Corresponding author:

Katrina Brown, Environment and Sustainability Institute, University of Exeter, Cornwall Campus, Penryn TR10 9LY, UK.

Email: katrina.brown@exeter.ac.uk

Table 1. Applications and core concepts of resilience.

Field	Applications	Concepts
International relations	Understanding military and terrorist threats	Security Critical infrastructure
Social ecological systems	Managing complex systems in times of change Informing adaptive management strategies	Adaptive cycle Adaptive capacity Transformations Linking social and ecological dimensions of resilience
Disasters and disaster risk reduction	Minimizing risk and support recovery	Vulnerability Community resilience
Climate change	Adapting to and minimizing impacts of climate change	Adaptation Adaptive capacity Climate resilience
Human development	Coping and thriving in times of adversity Individual responses to crises Poverty traps	Individual resilience Human well-being Capacity Agency
Organizational science and social innovation	Managing change	Social learning
Planning	Urban and regional planning	Urban resilience

report on resilience and African agriculture). The World Economic Forum's Global Risks 2013 report focuses on resilience (Howell, 2013), and 'Resilient Dynamism' was the theme of the Forum's 2013 annual meeting in Davos in January 2013 (see www.weforum.org/events/world-economic-forum-annual-meeting-2013).

So resilience ideas are powerful, but also they are highly contested. I do not revisit the term and its multiple definitions nor rehearse arguments for and against resilience, although I synthesize these in the next section. In accepting that resilience is here, perhaps to stay, and has immense traction and attraction, I reflect on how understandings are evolving based on recent literature across fields, and emerging social analysis of resilience. I examine whether there has been a significant social turn in resilience.

II Resilience and its discontents

Many publications have presented different accounts tracing the origins and evolution of resilience ideas (e.g. Bahadur et al., 2011; Folke,

2006; Martin Breen and Anderies, 2011). These acknowledge its scientific roots in diverse fields, including engineering, mathematics, complex systems analysis, development psychology and ecology. Generally, resilience ideas emerged in these fields during the 1960s and 1970s, but their applications spread significantly during the 1980s. Table 1 summarizes the fields, applications and core concepts that have developed around a broadly defined resilience.

Each of these different fields presents its own specific definition of resilience. Martin Breen and Anderies (2011) provide a comprehensive overview and analysis of different meanings across fields; Bahadur et al. (2011) distil 16 different perspectives related to climate change and development; Brand and Jax (2007) categorize ten definitions according to their degree of normativity; and Downes et al. (2013) examine empirical research on resilience. While the literal meaning of resilience¹ refers to the ability to bounce back, its meanings across these fields concern and envelop a range of different responses to change. The common ideas and

concepts include capacity, complexity, connectedness, adaptation and feedbacks (Brown and Westaway, 2011). In the global environmental change arena, the ideas on resilience have been mainly – though not exclusively – drawn from the field of ecology. These have spread to broader applications to linked social ecological systems (referred to as SES), and in turn these have influenced and are influenced by work on disasters and climate change adaptation (Adger et al., 2011; Ensor, 2011; Nelson et al., 2007; Pelling, 2010). These fields – and the resilience of SES – are the primary focus of my discussion.

Yet resilience ideas – resilience thinking (a phrase coined and explained by Walker and Salt, 2006) and practice (see Walker and Salt, 2012) – have generated a chorus of disapproval from different sources. Leach's edited account (2008) of a conference held at the University of Sussex adeptly summarizes the key tensions around resilience and its perceived limitations. First, there is the failure to recognize resilience as socially contingent, rarely addressing the question of 'resilience for whom?'; second, its mainstream usage is conservative, focused on the persistence of a 'system'; third, it focuses on a system which is disturbed by external or exogenous forces, so it underplays the internal, endogenous and social dynamics of the system. Further criticisms are as much about the production of the science as about the science itself. A number of authors highlight the institutionalization for resilience thinking through the journal *Ecology and Society* (www.ecologyandsociety.org), the Stockholm Resilience Center (Watts, 2011) and the scientific network, the Resilience Alliance (Hatt, 2013; Kirchhoff et al., 2010; www.resalliance.org), which Christmann et al. (2012: 18) refer to as enjoying 'discursive dominance' in the academic field of resilience, and influence on policy-makers (see Parker and Hackett, 2012, for an analysis of the Resilience Alliance as an 'affective network').

A common criticism is that resilience fails to take account of politics and power relations.

Beymer-Farris et al. (2012) signal two important aspects of resilience assumptions. First, in considering resilience as an end or an outcome of action, much literature on SES assumes there is consensus on the 'desired state' or that a desired state even exists. Second, resilience as a process overlooks conflicts over resources and the importance of power asymmetries. Thus, in focusing on management of ecosystem services for human well-being and development, resilience studies to date have not adequately considered whose needs are being met and the politics of their distribution and management. Cannon and Muller-Mahn (2010) highlight underlying conceptual contradictions in resilience, contending that it promotes a scientific and technical approach akin to 'imposed rationality' that is alien to the practice of ordinary people. Furthermore, resilience is depoliticized and does not take account of the institutions within which practices and management are embedded. Nadasdy (2007) provides an explanation of why, despite a rhetoric stressing management for resilience which might be at the expense of short-term stability, there are powerful interests to protect against such a dynamic or adaptive strategy.

The transference of ideas about ecological systems to the social realm is viewed as highly problematic. Building on social critiques of resilience, Hatt (2013) finds fault in the limitations of sociology integrated into resilience concepts. Functionalist sociology understands the social as a system, but is based on equilibrium ideas, so actually gives a static, non-dynamic social perspective. Hatt goes as far as to recognize that 'by adapting a view of the social that rested on an assumption of consensus and mechanical equilibrium, resilience thinking was adopting a view it had rejected in its own theorization on ecosystems' (p. 35). Cote and Nightingale (2012) contend that resilience in SES has 'evolved through the application of ecological concepts to society assuming that social and ecological system dynamics are

essentially similar' (p. 475) and believe that resilience ideas have grown in 'remarkable isolation from critical social science literature', while MacKinnon and Derickson (2013) claim 'resilience can be seen as the latest in a long line of naturalistic metaphors to be applied to cities and regions' (p. 258). Brand and Jax (2007) identify increased conceptual vagueness with resilience as it moves from ecological roots. On the one hand this makes resilience a loose 'boundary object' – malleable, slightly ambiguous and able to draw different interests and actors together – and on the other a descriptive ecological concept. They describe resilience as 'two-faced' (p. 9). But not only is resilience becoming increasingly vague and normative, its origins as a descriptive concept are being lost, and, in Brand and Jax's view, it is increasing conceived as a perspective or even as a way of thinking applied to social processes such as governance, social learning or leadership, or perhaps as a metaphor for the flexibility of a SES over the long term (p. 10). Kirchhoff et al. (2010) are also strongly critical of the way in which resilience ideas developed from one particular ecological perspective are extended to a social, economic and coupled SES. They assert that 'In extending its concept of ecological systems to social-ecological systems, the Resilience Alliance thus does not apply a value-free natural scientific concept to society ... but reapplies a particular cultural idea, which has been transformed into an only seemingly natural principle' (p. 31).

Thus MacKinnon and Derickson (2013: 262) assert that 'the vacuous yet ubiquitous notion that communities ought to be "resilient" can be seen as particularly troubling in the context of austerity and reinforced neoliberalism'. For them, the 'unsuitability of resilience in the social sphere' is not only that it is rooted in an underlying ecological concept, but that it has become entangled and co-opted by neoliberal modes of governance exacerbating and accentuating its essential conservatism. Reviewing the

World Resources Institute's report 'Roots of Resilience' (see Brown, 2012; WRI, 2008), Watts (2011: 88) states that 'ecological resiliency is the calculative metric for a brave new world of turbulent capitalism and the global economic order, and a new ecology or rule'. Bronwyn Hayward has noted similar issues in her discussion of post-earthquake Christchurch (Hayward, 2011). Analysis of policy discourses of resilience (Brown, 2012) demonstrates how applications of resilience in field of climate change and development overwhelmingly support the status quo and promote 'business as usual'. As Jerneck and Olsson argue (2008: 179–180), ideas of resilience underline recovery more than fundamental change and thus are more likely to support incremental rather than profound change – furthermore, it might even stand in the way of fundamental changes in response to climate change by supporting particular types of adaptation, which actually enable people to continue practices which are unsustainable in the longer term (see also Adger et al., 2011; Barnett and O'Neill, 2010; O'Neill and Handmer, 2012). In a similar vein, Gaillard (2010) examines the interplay of vulnerability and resilience concepts in science and policy surrounding disasters, exposing contradictions and inconsistencies in how the terms are used, and comments that a resilience approach, while bringing capacities to the fore, negates consideration of root causes of vulnerability.

III Socializing resilience

Adger's (2000) paper in *Progress in Human Geography* asked whether ecological and social resilience are related. His article remains one of the top-cited papers from this journal and has generated many discussions about whether and how social resilience is distinct from ecological resilience, and how valid it is to integrate social and ecological dimensions. Adger (2000) defined social resilience as the ability of communities to withstand shocks to their social

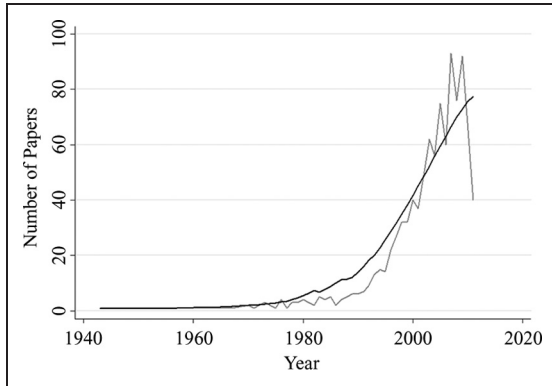


Figure 1. Social science publications on resilience in social ecological systems (SES).

infrastructure (p. 361) and his approach recognizes social resilience both as an analogue to ecological resilience, but also linked to ecological resilience through closely coupled co-evolutionary systems of natural resources and the communities that depend on them. In this report, I analyse how more recent literature has extended and integrated these social dimensions into resilience concepts, and whether and how this addresses some of the criticisms I outlined earlier.

There is certainly evidence of increased social science analysis of resilience. The Resilience 2011 conference in Arizona involved more than 700 attendees and 500 papers, and had a high proportion of social science oriented papers and panels.² Analysis of Web of Science and more than 900 papers using resilience in the title or keywords reveals a marked upward trend in social science publications in the last decade (Figure 1). From my reading across these literatures, I identify three key topics that have emerged in the past two to three years expanding social dimensions of resilience, and I briefly discuss these and relate them back to the critical literature. This does not represent a comprehensive analysis of the whole field of resilience and its applications; rather it is a selective and focused reading. I look at how recent studies of community resilience add to understanding

of social dynamics; how resilience theories conceptualize the relationship of resilience to transformational change rather than adaptation or maintaining the status quo; and how resilience ideas are being applied and whether they are in fact able to foster radical change.

1 Community resilience

Recognizing that resilience thinking in SES under-theorizes the social, increasing numbers of studies published in interdisciplinary journals aim to redress the balance and to strengthen both theoretical components and the policy relevance of resilience (Armitage et al., 2012; Davidson, 2010). For example, Robards et al. (2011) directly address the omission of politics and social dynamics in the resilience literature in their analysis of how agency and collective action of powerful and disenfranchised actors, and power and information asymmetries, affect the delivery of ecosystem services, arguing for more deliberative and pluralist views of managing SES. One approach to socializing resilience has been to integrate ecological or SES perspectives on resilience with those from human development or psychology, emphasizing issues of agency and capacity (Brown and Westaway, 2011; Coulthard, 2011). Coulthard (2011) specifically examines agency in bringing insights from well-being research to bear on resilience thinking (see also Armitage et al., 2012). O'Brien et al. (2009) use resilience thinking as a lens to examine changing social contracts under climate change, and highlight how a social contracts understanding of governance informs resilience in terms of bringing power, trade-offs and rights of distant and future others into the analysis.

Community resilience has recently emerged as a topic of discussion around social difference and social dynamics, and brings insights from human development and disasters and health into SES approaches (Brown and Westaway, 2011; Masten and Obradovic, 2008; Norris

et al., 2008). In a recent paper, Berkes and Ross (2013) develop an integrated conceptualization of community resilience that brings together understandings from SES, and the psychology of development and mental health field, two strands of literature they claim have been ‘converging towards an appreciation of community resilience’. But their articulation of community resilience is challenged by Davidson (2013), as still inadequately considering agency and power. A number of recent applications (e.g. Buikstra et al., 2010) have developed assessments of community resilience.³ Amundsen’s (2012) analysis of one village in northern Norway warns of the ‘illusion’ of resilience that may lead to complacency and actually undermine or discourage adaptation to multiple change factors. While there is the danger of romanticizing community and capacities of people in the face of change (see, for example, discussions around ‘indigenous resilience’; Rival, 2009; Rotarangi and Russell, 2009), Kuecker and Hall (2011) see peripheral and semi-peripheral regions as emergent, providing the sites for innovation and strategies to overcome collapse, key characteristics of resilience. However, others challenge the ability of the community focus to adequately address multi-scalar notions of resilience (Davidson, 2013; Quilley, 2012); and again the omission of structural factors and political dynamics from analysis of community resilience is observed.

2 Transformation and resilience

Transformation is increasingly a core element of debates around global environmental change and societal responses (Hackman and St Clair, 2012; O’Brien, 2012). It is argued, first, that global environmental change will enforce radical, unplanned and detrimental transformation especially through impacts of climate change. Second, there is a normative imperative for planned and profound transformation, especially of energy and consumption, to avoid the worst

impacts of these changes, and to implement sustainability (Kates et al., 2012).

The meaning of resilience concepts in this discussion of transformation is ambiguous. As noted, resilience is often viewed as inherently conservative and its central focus on bouncing back works against more profound change. However, more recent writings on resilience in SES signal a realignment – indeed a redefinition – of resilience linked to profound change and to transformation. Although the edited volume *Panarchy* (Gunderson and Holling, 2002) and Walker et al. (2004) theorized transformation and resilience, recent literature has reaffirmed this emphasis with frequent linking of resilience and transformation. For example, Folke et al. (2010) assert that adaptation and transformation are essential to maintain resilience, that ‘the very dynamics between periods of abrupt and gradual change and the capacity to adapt and transform for persistence are at the core of resilience of SES’ (p. 1). Social change – profound change – is required for persistence in the ‘Holocene stability domain’. The key to this (apparently counterintuitive) relationship between transformation and adaptation is cross scale dynamics, so that, according to Folke et al. (2010: 3), active transformation is ‘the deliberate initiation of a phased introduction of one or more new state variables at lower scales, while maintaining the resilience of the system at higher scales as transformational change proceeds’. The resilience literature generally acknowledges that transformational change involves not just a shift in ‘state variables’ but also shifts in perception and meaning, patterns of interaction among actors including leadership and political and power relations and institutional arrangements (Folke et al., 2010: 5). Thus Chapin et al. (2010) refer to transformation as a fundamental change in an SES resulting in different controls over system properties, new ways of making a living and often changes in scales of crucial feedbacks. Adjustments occur at all (and interlinked) scales – for

individuals, society, institutions, technology, economy and ecology – and may involve changes to practices, lifestyles, power relations, norms and values. There is often an emphasis on learning, and transformation necessitates a commitment to innovation, novelty and diversity in order to imagine alternatives and possible futures (Schoon et al., 2011). Another set of papers discuss the role and scope for agency, innovation and novelty within resilience framing for understanding transformation, adopting language and concepts from transitions literature (Haxeltine and Seyfang, 2009; Loorback, 2010; Westley et al., 2011). Olsson has used transition theoretical constructs to analyse transformations in SES management, for example in Swedish wetlands and the Great Barrier Reef Marine Park (Olsson et al., 2006).

But there is ongoing debate, especially in the environmental change literature, about the relationship between transformational change and resilience. Some analysts contend that resilience is quite distinct from and cannot support transformational change. In line with the views of resilience as conservative, Pelling's (2010) work on climate change adaptation sees resilience approaches as quite distinct from transition or transformation. Indeed, some recent writings separate adaptive resilience and transformative resilience (Christmann et al., 2012; Goldstein, 2013; Shaw, 2012; Wilson et al., 2013). Jonathan Ensor's work on climate change adaptation has moved from an approach that presented resilience as one part of a continuum to one that sees resilience as a property which can be applied across different approaches to adaptation (Ensor, 2011; Ensor and Berger, 2009; see also Nelson et al., 2007). But this topic remains empirically rather sparse (important exceptions being Marshall et al., 2012, and Park et al., 2012), and there is no single agreed definition or understanding of transformation, and many normative assumptions abound, not least about the assumed desirability of transformational change – echoing normative stances on resilience (Brown et al., 2013).

3 Resilience transitions

While the debates about multiple meanings and interpretations of resilience rage on in the scientific literature, and the discussions between policy and science converge, resilience has been seized and is being used in quite different ways by civil society groups, social movements and communities. Counter to the arguments about resilience as supporting regressive and neoliberal agendas, resilience is being used as an organizing principle by communities to challenge the status quo and to design and shape alternative futures. The Transition Towns movement is an exemplar (see www.transitionnetwork.org for the UK, www.resilience.org for the USA) using resilience as a central organizing principle and a core objective for community and personal transitions. Quilley (2012) shows how the UK Transition movement adopts core resilience concepts – such as the adaptive cycle and panarchy – from the SES literature. Rob Hopkins' latest book (2013) casts community resilience as localism and economic development, and defined by 'the set of possibilities that the community believes it has at its disposal' (p. 64). Of course, resilience is prominent in many other community development and action initiatives. A Carnegie Trust report (Wilding, 2011) describes community resilience as a 'youthful and vibrant field' (p. 28) and simultaneously uses scientific literature (with references to Holling on ecology, Walker on SES, Meadows and Lewins on complexity, Maston on psychology) with government and community perspectives to shape a resilience which suits the purposes of localization, diversity and activism. This vision acknowledges that resilience has a 'dark side' (see also Brown, 2012; Leach, 2008) but negotiates a vision for resilience which puts concerns for social justice and social capital at the centre. However, MacKinnon and Derickson (2012) find the adoption of resilience – as a regressive concept embedded in neoliberal modes of governance – by opposition groups

‘deeply problematic’. But other scholars see resilience as contributing to a move away from conventional sustainable development (Barry, 2012) or towards transition (Haxeltine and Seyfang, 2009) or deliberative transformation (O’Brien, 2012).

Other authors have analysed resilience as a means of opening space for negotiations across government (see, for example, DFID, 2011) or between the state and publics. Shaw (2012), discussing resilience applied to local government, sees resilience as extending the sustainable development agenda, which he contends remains marginalized in most local authorities. Thus resilience centralizes climate change as the defining feature of local government and governance. Goldstein et al. (2013) suggest collaborative resilience as a contribution towards deliberative planning, arguing that pursuing resilience through inclusive planning and engaging with communities through narratives reveals subjective and symbolic meanings of resilience. Thus resilience is shown to support more transformative inclusive and dynamic approaches to designing urban systems, although there are discussions in urban and regional planning about how and where this might be effected (e.g. Davoudi and Porter, 2012; Tyler and Moench, 2012).

IV Conclusion

Is there evidence of a social turn in resilience applied to global environmental change? I conclude that there are significant advances and a much greater engagement and reflection on social dimensions, manifested in growing literature and debates on social dynamics. But there are still strong normative assumptions in much of the writing, and only recently have there been acknowledgement of and encounters with approaches of political ecology (for example, the volume edited by Plieninger and Bieling, 2012) and philosophy and sociology of science, such as recognizing the dangers of scientization

(highlighted by Robards et al., 2011). While resilience ideas and applications are disputed and critiqued, I suggest that its multiple meanings and interpretations can – and should – result in rich scholarship and discussion. In many ways, resilience is similar to sustainability (Brown, 2011), in that the very malleability and plasticity of the term itself at the same time means it can act as a boundary object or bridging concept, but it is also co-opted by different interests. However, the creative alternatives that resilience has contributed to are significant and surprising, opening important debates and space for discussion about uncertain futures.

Acknowledgements

I thank Jacopo Baggio and Marty Anderies from Arizona State University for providing analysis for Figure 1 and for information on Resilience 2011 panels.

Notes

1. The Oxford English Dictionary definition of resilience is: 1. the ability to recoil or spring back into shape after bending, stretching, or being compressed; 2. (of a person) ability to withstand or recover quickly from difficult conditions. The word originates from the Latin *resilire* ‘leap back’.
2. Panels themes included urban resilience, children’s resilience, development pathways, community governance, multi-level governance, social innovation, and indigenous knowledge (see <http://csid.asu.edu/resilience-2011/program>).
3. There is also a large literature applying the resilience lens to conceptualizing and assessing adaptive capacity and social resilience (e.g. Maclean et al., 2013).

References

- Adger WN (2000) Social and ecological resilience: Are they related? *Progress in Human Geography* 24(3): 347–364.
- Adger WN, Brown K, Nelson DR, et al. (2011) Resilience implications of policy responses to climate change. *WIREs Climate Change* 2: 757–766.
- Amundsen H (2012) Illusions of resilience? An analysis of community responses to change in northern Norway. *Ecology and Society* 17(4): 46.

- Armitage D, Bene C, Charles AT, et al. (2012) The interplay of wellbeing and resilience in applying a social-ecological perspective. *Ecology and Society* 17(4): 15.
- Bahadur AV, Ibrahim M, and Tanner T (2011) The resilience renaissance? Unpacking of resilience for tackling climate change and disasters. Strengthening Climate Resilience Discussion Paper 1. Brighton: Institute of Development Studies.
- Barnett J and O'Neill SJ (2010) Maladaptation. *Global Environmental Change* 20: 211–213.
- Barry J (2012) Climate change, 'the cancer stage of capitalism' and the return of the limits to growth. In: Pelling M, Manuel-Navarrete D, and Redclift M (eds) *Climate Change and the Crisis of Capitalism*. Abingdon: Routledge, 129–142.
- Berkes F and Ross H (2013) Community resilience: Towards an integrated approach. *Society and Natural Resources* 21(1): 5–20.
- Beymer-Farris BA, Bassett TJ, and Bryceson I (2012) Promises and pitfalls of adaptive management in resilience thinking: The lens of political ecology. In: Plieninger T and Bieling C (eds) *Resilience in the Cultural Landscape*. Cambridge: Cambridge University Press, 283–299.
- Brand F and Jax K (2007) Focusing the meaning(s) of resilience: Resilience as a descriptive concept and a boundary object. *Ecology and Society* 12(1): 23.
- Brown K (2011) Sustainable adaptation: An oxymoron? *Climate and Development* 3: 21–31.
- Brown K (2012) Policy discourses of resilience. In: Pelling M, Manuel-Navarrete D, and Redclift M (eds) *Climate Change and the Crisis of Capitalism*. Abingdon: Routledge, 37–50.
- Brown K and Westaway E (2011) Agency, capacity, and resilience to environmental change: Lessons from human development, well-being, and disasters. *Annual Review of Environment and Resources* 36(1): 321–342.
- Brown K, O'Neill SJ, and Fabricius C (2013) Interrogating transformation: Social science perspectives. In: *World Social Science Report 2013*, forthcoming.
- Buikstra E, Ross H, King CA, et al. (2010) The components of resilience: Perceptions of an Australian rural community. *Journal of Community Psychology* 38: 975–991.
- Cannon T and Muller-Mahn D (2010) Vulnerability, resilience and development discourses in context of climate change. *Natural Hazards* 55(3): 621–635.
- Chapin FS III, Carpenter SR, Kofinas GP, et al. (2010) Ecosystem stewardship: Sustainability strategies for a rapidly changing planet. *Trends in Ecology and Evolution* 25: 241–249.
- Christmann G, Ibert O, Kilper H, et al. (2012) Vulnerability and resilience from a socio-spatial perspective: Towards a theoretical framework. IRS Working Paper 45. Erkner: Leibniz Institute for Regional Development and Structural Planning. Available at: www.irs-net.de/download/wp_vulnerability.pdf.
- Cote M and Nightingale AJ (2012) Resilience thinking meets social theory: Situating social change in social ecological systems. *Progress in Human Geography* 36(4): 475–489.
- Coulthard S (2011) Can we be both resilient and well and what choices do people have? Incorporating agency into the resilience debate from a fisheries debate. *Ecology and Society* 17(1): 4.
- Davidson DJ (2010) The applicability of the concept of resilience to social systems: Some sources of optimism and nagging doubts. *Society and Natural Resources* 23: 1135–1149.
- Davidson DJ (2013) We still have a long way to go, and a short time to get there: A response to Fikret Berkes and Helen Ross. *Society and Natural Resources* 26: 21–24.
- Davoudi S and Porter L (2012) Applying the resilience perspective to planning: Critical thoughts from theory and practice. *Planning Theory and Practice* 13(2): 299–333.
- Department for International Development (DFID) (2011) Defining disaster resilience: DFID approach paper. Available at: <http://www.dfid.gov.uk/Documents/publications/1/Defining-Disaster-Resilience-DFID-Approach-Paper.pdf>.
- Downes BJ, Miller F, Barnett J, et al. (2013) How do we know about resilience? An analysis of empirical research on resilience, and implications for interdisciplinary praxis. *Environmental Research Letters* 8: 014041.
- Ensor J (2011) *Uncertain Futures: Adapting Development to a Changing Climate*. Rugby: Practical Action Publishing.
- Ensor J and Berger R (2009) *Understanding Climate Change Adaptation: Lessons from Community-Based Approaches*. Rugby: Practical Action Publishing.
- Folke C (2006) Resilience: The emergence of a perspective for social-ecological systems analyses. *Global Environmental Change* 16: 253–267.
- Folke C, Carpenter SR, Walker B, et al. (2010) Resilience thinking: Integrating resilience, adaptability and transformability. *Ecology and Society* 15(4): 20.

- Gaillard J (2010) Vulnerability, capacity and resilience: Perspectives for climate and development policy. *Journal of International Development* 232: 218–232.
- Goldstein B, Lejano R, Wessels A, et al. (2013) Narrating resilience: Transforming urban systems through collaborative storytelling. *Urban Studies*, forthcoming.
- Gunderson LH and Holling CS (eds) (2002) *Panarchy: Understanding Transformations in Human and Natural Systems*. Washington, DC: Island Press.
- Hackman H and St Clair AL (2012) *Transformative Cornerstones of Social Science Research for Global Change*. Paris: ISSC.
- Hatt K (2013) Social attractors: A proposal to enhance ‘resilience thinking’ about the social. *Society and Natural Resources* 26(1): 30–43.
- Hayward B (2011) Rethinking resilience: Reflections on the Christchurch earthquake and aftershocks. In: *Proceedings of the New Zealand Eco-Conference, Parnell Community Centre, Auckland New Zealand, 1–3 July*. Available at: [http://www.eco.org.nz/uploads/Annual-20Report%20and%20Conferences/Rethinking%20Resilience%20v2%20Hayward%20\(2011\)%204%20pgs-20.pdf](http://www.eco.org.nz/uploads/Annual-20Report%20and%20Conferences/Rethinking%20Resilience%20v2%20Hayward%20(2011)%204%20pgs-20.pdf).
- Haxeltine A and Seyfang G (2009) Transitions for the people: Theory and practice of ‘transition’ and ‘resilience’ in the UK’s transition movement. Tyndall Centre Working Paper. Available at: <http://www.tyndall.ac.uk/sites/default/files/twp134.pdf>.
- Hopkins R (2013) *The Power of Just Doing Stuff*. Cambridge: IUT/Green Books.
- Howell L (ed.) (2013) Global risk report 2013. Geneva: World Economic Forum. Available at: www3.weforum.org/docs/WEF_GlobalRisks_Report_2013.pdf.
- Jerneck A and Olsson L (2008) Adaptation and the poor: Development, resilience and transition. *Climate Policy* 8: 170–182.
- Kates RW, Travis WR, and Wilbanks TJ (2012) Transformational adaptation when incremental adaptations to climate change are insufficient. *Proceedings of the National Academy of Science* 109: 7156–7161.
- Kirchhoff T, Brand FS, Hoheisel D, et al. (2010) The oneness and cultural bias of the Resilience Approach. *GAI* 19(1): 25–32.
- Kuecker DG and Hall TD (2011) Resilience and community in the age of world systems collapse. *Nature and Culture* 6(1): 18–40.
- Leach M (ed.) (2008) Reframing resilience: A symposium report. STEPS Working Paper 13. Brighton: STEPS Centre.
- Loorbach D (2010) Transition management for sustainable development: A prescriptive, complexity-based governance framework. *Governance* 23: 161–183.
- MacKinnon D and Derickson KD (2012) From resilience to resourcefulness: A critique of resilience policy and activism. *Progress in Human Geography* 37(2): 253–270.
- Maclean K, Cuthill M, and Ross H (2013) Six attributes of social resilience. *Journal of Environmental Planning and Management*. doi: 10.1080/09640568.2013.763774.
- Marshall NA, Park SE, Adger WN, et al. (2012) Transformational capacity and the influence of place and identity. *Environmental Research Letters* 7: 034022.
- Martin Breen P and Anderies JM (2011) Resilience: A literature review. The Rockefeller Foundation. Available at: <http://www.rockefellerfoundation.org/news/publications/resilience-literature-review>.
- Masten AS and Obradovic J (2008) Disaster preparation and recovery: Lessons from research on resilience in human development. *Ecology and Society* 13(1): 9.
- Montpellier Panel (2012) The Montpellier Panel Report. Available at: <http://www3.imperial.ac.uk/africanagriculturaldevelopment/themontpellierpanel/themontpellierpanelreport2012>.
- Nadasdy P (2007) Adaptive co-management and the gospel of resilience. In: Armitage D, Berkes F, and Doubleday N (eds) *Adaptive Co-Management: Collaboration, Learning and Multi-Level Governance*. Vancouver: UBC Press, 208–227.
- Nelson D, Adger WN, and Brown K (2007) Resilience and adaptation to climate change: Linkages and a new agenda. *Annual Review of Environment and Resources* 32: 395–419.
- Norris FH, Steves SP, Pfefferbaum B, et al. (2008) Community resilience as a metaphor, theory, set of capacities and strategy for disaster readiness. *American Journal of Community Psychology* 41: 127–150.
- O’Brien K (2012) Global environmental change II: From adaptation to deliberate transformation. *Progress in Human Geography* 36(5): 667–676.
- O’Brien K, Hayward B, and Berkes F (2009) Rethinking social contracts: Building resilience in a changing climate. *Ecology and Society* 14(2): 12.

- Olsson P, Gunderson LH, Carpenter SR, et al. (2006) Shooting the rapids: Navigating transitions to adaptive governance of social-ecological systems. *Ecology and Society* 11(1): 18.
- O'Neill S and Handmer J (2012) Responding to bushfire risk: The need for transformative adaptation. *Environmental Research Letters* 7: 014018.
- Park SE, Marshall NA, Jakku E, et al. (2012) Informing adaptation responses to climate change through theories of transformation. *Global Environmental Change* 22: 115–126.
- Parker JN and Hackett EJ (2012) Hot spots and hot moments in scientific collaboration and social movements. *American Sociological Review* 77(1): 21–44.
- Pelling M (2010) *Adaptation to Climate Change: From Resilience to Transformation*. Abingdon: Routledge.
- Plieninger T and Bieling C (2012) *Resilience in the Cultural Landscape*. Cambridge: Cambridge University Press.
- Quilley S (2012) Resilience through relocalisation: Ecocultures through transition? Ecocultures Working Paper 2012-1, University of Essex. Available at: <http://www.ecocultures.org/2012/05/resilience-through-relocalisation-ecocultures-of-transition>.
- Rival L (2009) The resilience of indigenous intelligence. In: Hastrup K (ed.) *The Question of Resilience: Social Responses to Climate Change*. Copenhagen: The Royal Danish Academy of Sciences and Letters, 293–313.
- Robards M, Schoon ML, Meek C, et al. (2011) The importance of social drivers in the resilient provision of ecosystem services. *Global Environmental Change* 21(2): 522–529.
- Rotarangi S and Russell D (2009) Social-ecological resilience thinking: Can indigenous culture guide environmental management? *Journal of the Royal Society of New Zealand* 39(4): 209–213.
- Schoon M, Fabricius C, Anderies JM, et al. (2011) Synthesis: vulnerability, traps, and transformations – long-term perspectives from archaeology. *Ecology and Society* 16(2): 24.
- Shaw K (2012) The rise of the resilience local authority? *Local Government Studies* 38(3): 281–300.
- Tyler S and Moench M (2012) A framework for urban climate resilience. *Climate and Development* 4(4): 311–326.
- United Nations Secretary-General's High-level Panel on Global Sustainability (2012) Resilient people, resilient planet: A future worth choosing. Report. New York: United Nations.
- Walker B and Salt D (2006) *Resilience Thinking*. Washington, DC: Island Press.
- Walker B and Salt D (2012) *Resilience Practice*. Washington, DC: Island Press.
- Walker BH, Holling CS, Carpenter SR, et al. (2004) Resilience, adaptability and transformability in social-ecological systems. *Ecology and Society* 9(2): 5.
- Walsh B (2013) Adapt or Die: Why the environmental buzzword of 2013 will be resilience. *Time: Science and Space* 8 January. Available at: <http://science.time.com/2013/01/08/adapt-or-die-why-the-environmental-buzzword-of-2013-will-be-resilience/#ixzz2JeE6rFwE>.
- Watts M (2011) On confluences and divergences. *Dialogues in Human Geography* 1: 84–89.
- Westley F, Olsson P, Folke C, et al. (2011) Tipping toward sustainability: Emergent pathways of transformation. *Ambio* 40: 762–780.
- Wilding N (2011) Exploring community resilience in times of rapid change. Dunfermline: Fiery Spirits Communities of Practice and Carnegie UK Trust. Available at: <http://www.carnegieuktrust.org.uk/carnegie/media/sitemedia/Publications/ExploringCommunityResilience/download.pdf>.
- Wilson S, Pearson L, Kashima Y, et al. (2013) Separating adaptive maintenance (resilience) and transformative capacity of social ecological systems. *Ecology and Society* 18(1): 22.
- World Resources Institute (WRI) (2008) *Roots of Resilience: World Resources Report*. Washington DC: World Resources Institute.