

Resilience, Realities and Research in African Environments



**Report of Workshop 18 June 2007
University of Oxford**

© 2007 Authors: Henny Osbahr, University of Reading with Emily Boyd, James Martin 21st
Century School, University of Oxford and Polly Ericksen, GECAFS
For further information: h.osbahr@reading.ac.uk

Report Structure

	<i>page</i>
<i>Preface</i>	4
<i>Executive summary</i>	5
Session 1 Is resilience theory useful to interdisciplinary researchers?	7
Session 2 Resilience depends on scale: what has meaning in measurement?	13
Session 3 Using 'resilience' to promote sustainability in development practice	16
<i>Summary of themes arising from the meeting</i>	20
Annex 1 List of participants	23

Preface

This one-day workshop, hosted by the Oxford University Centre for the Environment, was held at Jesus College Oxford on 18 June 2007, as part of a series of meetings by the Oxford African Environments Programme. The workshop was funded by an ESRC-NERC grant (held by Henny Osbahr and Patricia Daley at the Oxford University Centre for the Environment), the Environmental Change Institute and the international Global Environmental Change and Food Systems Project.

The workshop was conceived as a forum to discuss emerging research agendas that inform development, research and policy. The sessions were structured by theme, with short 'think-piece' presentations to generate a debate between interdisciplinary participants, which included decision-makers, funders, practitioners and researchers. The organisers have an editorial in *Ecology and Society* on the topic and a forthcoming think-piece and paper will be developed from the meeting (to be also made available from the website). We gratefully acknowledge the input of participants.

Dr Henny Osbahr
Dr Emily Boyd
Dr Polly Ericksen

Executive Summary

'Resilience, realities and research in African Environments?' was an interdisciplinary workshop focusing on development in Africa. The meeting attempted to bridge the link between interdisciplinary scientists, decision makers and practitioners, and presentations based on their experiences facilitated discussion. Resilience, adaptation, and vulnerability are fertile and dynamic areas of interdisciplinary research and, given the growing mainstream interest on ideas of 'resilience', the first session considered how resilience theory is useful in understanding social-ecological systems. Participants noted that different disciplines and stakeholders have adopted a resilience approach in diverse ways and have different interpretations of its value. Participants focused on whether using resilience concepts helps in understanding complex adaptive systems, citing examples from Africa. The strength of a resilience approach is that it helps to explain societies' relationship to both slow and rapid change and the processes and characteristics associated with this change. Resilience allows researchers to consider the *relations* between social and ecological systems, or the 'coupleddness', thus minimising the society-environment dichotomy. The challenge is to articulate these feedbacks more clearly in practice so that a more informed understanding can contribute to better management/ desirable social outcomes. The introduction of the social into resilience approaches requires a greater engagement between resilience thinking and social theory, particularly contributions from political ecology, political economy and development studies in order to address issues of social differentiation, marginality and vulnerability.

The second session discussed how the scale of measurement frames 'resilience'. Participants drew on case study evidence to consider questions of the cross-scale dimension of resilience, especially the implications and usefulness of scale measurements for management targets. The session focused on the problem of measurement and indicators when complex systems are constantly transforming and different approaches (perspectives) reach different conclusions about the same systems). The session aimed to move beyond semantics and discussion at a global level to consider the evidence on the relationship between the national-local levels.

The final session sought to discuss whether resilience is key to successful environmental management or an important concept that is difficult to apply in practice. One of the biggest challenges is taking this enormous amount of theoretical knowledge into policy and practitioner domains - are ideas about resilience analytically useful or is it inherently difficult to assess complex socio-cultural, especially within historically embedded settings? For example, finding indicators for resilience in human systems, which allow comparison of communities across different time horizons, can be difficult, as institutions promote and limit adaptive capacity to different groups and at different scales. The heterogeneity resulting from this complexity makes a standardized comparison difficult, especially as the mechanisms governing social systems are profoundly different from those governing ecological systems. Questions raised included: What are the best applications of resilience ideas to support managing uncertainty in socio-ecological systems? Is this a theoretical approach, a tool or an opportunity to influence policy? The purpose was to offer a forum for discussion between scientists, policy makers and NGOs. In particular, participants considered the role of resilience in practice, the gap between scientific resources and delivery,

and multi-level governance. This raised additional questions on the trade-off for long-term goals and the links between justice, resilience and sustainability.

Messages on resilience and development:

- Consideration of politics and power is important to the way research questions are formulated, and it is crucial to engage early with partners and policy to support long-term work.
- When focusing on resilience for more ‘desired states’, we need to make our assumptions and normative goals explicit because this relates to perceived ‘realities’ and governance issues.
- Resilience is a positive concept because it highlights the role of agency, motivation and capacity, making it attractive for policy makers and for practice.
- A resilience approach forces us to consider both social and ecological goals simultaneously, so it is helpful for achieving sustainable development.

Promising areas of new research:

- Cross-scale interactions and the role of bridging institutions.
- ‘Pathways of manoeuvrability’ highlight the role of networks, relationships, learning and local institutions in environment-human interactions.
- Understanding the positive and negative aspects of livelihood diversification (e.g. exposure to market risks, lack of appropriate institutional support etc).
- Resilience is just one tool in our conceptual toolbox and there is value in targeting different groups and identifying thresholds of potential concern through quantitative and qualitative methods of analysis.
- Considering power and politics as key mechanisms that govern social-ecological systems but require additional social theory to explain.

Session 1

Is resilience theory useful to interdisciplinary researchers?

There is a growing mainstream interest on ideas of ‘resilience’. However, different disciplines and stakeholders have adopted the concepts in diverse ways and have different interpretations of its value. The session asked participants to focus on identifying whether it is possible to use underlying concepts about resilience to help interdisciplinary researchers in understanding complex and changing adaptive systems. Space was given to discussing what we mean by ‘resilience’ in socio-ecological systems using examples from Africa. The session was chaired by Professor Diana Liverman (Director of the Environmental Change Institute, Oxford) and began with five short plenary presentations, which highlighted the theoretical debate from different disciplinary backgrounds.

Dr Emily Boyd (James Martin Fellow, ECI Oxford, with colleagues Henny Osbahr, Polly Ericksen, Maria Carmen Lemos and Emma Tompkins) opened the session with a think-piece on the need to reconcile resilience and development theories to better inform practice (the theme of the day). She outlined common perceptions of development within the expansion and extension of generally capitalist systems of production, exchange and regulation. Development has traditionally focused on organized interventions with goals, to achieve progressive expansion of economic and social networks across different scales. Boyd summarised ideas within recent development thinking, including sustainable development, globalization and rescaling development, development alternatives, environmental risk and transformations. Boyd highlighted the overlapping interests of resilience and development by giving examples of self-organisation, the building of adaptive capacity, and buffering of shocks in development initiatives. She raised four questions for discussion. Are elements of the resilience approach and the development approach similar, or are there divergent ideas regarding buffering and transforming? She suggested that the current sustainable development paradigm is flawed because it is based on a ‘continuum’, which is a false dichotomy. Instead, resilience theory offers a coupled socio-ecological system. But are there still tradeoffs? The questions of ‘resilience of what’ is not clear within the development community - is the community persistent, stable or adaptive? Without clear management goals, it will not be possible to measure resilience. Who defines what to measure? The resilience approach has not to date explicitly incorporated knowledge about power and equity in social systems. In fostering resilience in development, policy makers must make choices while complex transformations are taking place. The paper argued that this would help researchers, decision-makers and practitioners to reflect and reassess how we look at development in Africa.

Eric Lambin (University of Louvain) followed by emphasising the special aspect that resilience brings to the debate, through the coupled nature and co-evolution of socio-environmental systems where adaptations affect both the natural and social. He outlined the linkages and feedbacks between the social and biophysical driving forces and organization levels (e.g. region, landscape or unit of production). Lambin emphasised the complexity in reality that can be represented within resilience ideas, with multiple agents, multiple uses of land (multifunctional landscapes), multiple responses to social, climatic and ecological changes, multiple connections in social and geographical spaces, and multiple spatial and

temporal scales. He illustrated this complexity using a research example of work on the Serengeti-Mara ecosystem with Katherine Homewood and others - in Kenya, there has been a 75% decrease in wildebeest population since 1977 and, during the same period, 50, 000ha of rangelands were converted to cropland, with mechanised farming abandoned when the land becomes degraded. He argued that to understand the resilience of a complex socio-ecological system, researchers cannot rely on the obvious patterns that a natural scientific analysis first suggests. To understand the complex coupled human-environment system, researchers need to understand the role of the Massai livelihood, land-use strategies, history, controlling models of different actors, management and policies, organisation and scales, system dynamics, learning and adaptation by actors etc.

Lambin focused on three key aspects: information, motivation and capacity. He explained the importance of information to decision makers in their understanding of resource management options and in communication between different institutional scales (e.g. for detecting perturbation from the background noise of natural variability, recognition of relevance of environmental changes and proper valuation of ecosystem services using different knowledge systems). Motivation governed the behaviour of agents in the system and was necessary to understand and evaluate response options to environmental change. He outlined a number of motivational issues, including attitude, value, ideological barriers, balance of risk-adjusted benefits and costs (taking into account the time horizon of managers and externalities), perverse subsidies and tax incentives that can result in inefficiency, conflicts of interest between stakeholders, and the fit between ecosystems and institutional systems. The capacity (or resources to implement change in environmental management) requires the provision of appropriate infrastructure. Lambin suggested this required the capacity to rapidly modify rules governing access to and use of resources, a diverse portfolio of new technologies, social capital between resource users to deal with conflicts and induce compliance with rules, production surplus for capital investments, and readiness to change and adapt, by inspiring leaders. He concluded by illustrating the complexity of factors involved in driving land-use trends in Africa.

An ecological perspective within resilience theory was offered by **Graeme Cumming** (University of Cape Town), drawing on his experience in African systems. He defined the resilience in the ecological system as ‘the amount of change that the system can undergo and still maintain the same controls on function and structure’. The system’s ability to self-organize and capacity to learn and adapt are important characteristics. He illustrated the concepts using an example of watershed resilience. Essentially, Cumming argued that resilience is ‘integrative’: the interconnections between different systems, dynamic change, transfer of ideas and metaphors between systems (e.g. the adaptive cycle) and as a platform for interdisciplinary research.

Cumming questioned the perception that resilience is too abstract and a difficult approach for decision-makers. For example, can it be measured directly, that systems are either ‘too big’ or ‘too slow’ to experiment on, that so much complexity appears apparently irreducible, and that understanding of a system’s resilience is contingent on future (unknown) conditions. He argued that to ‘operationalise’ resilience, clarity must first be achieved on scale of analysis (both spatial and temporal), the system components and relationships that are “essential”, whose interests will be represented? (the visions and values of the researcher, policy maker and community for example) and specified future perturbations. Cumming

suggested that the workshop offered forum to discuss how researchers can contribute to this debate.

From an ecological perspective, Cumming explained that a social-ecological system can be defined as consisting of essential actors, components, and interactions. He suggested that preserving 'system identity' consists of maintaining these elements through space and time. Therefore, resilience can be redefined as the ability of the system to maintain its identity in the face of internal change and external perturbations. He outlined indicators for capturing ecological resilience.

His research in Zimbabwe on the interactions between biodiversity and vegetation type suggested that high densities of elephants had a negative effect on species richness of trees, ants, and woodland birds. A loss of large trees leads to a regime shift to thicket and a reduction in structural and compositional diversity. To enhance ecological resilience a number of specific criteria could be fulfilled. He acknowledged that there were social influences, such as increased human populations in the communal lands, requiring extra grazing lands. Capturing and enhancing social resilience was more complex and Cumming acknowledged that it might be easier to single out 'identity' in natural systems and that focusing on ecosystems can reduce social resilience (e.g. invasion of game farms in Zimbabwe). In conclusion, he argued that it was important for more research to attempt to capture the identity of the coupled Social-Ecological System. In doing so, this would highlight the complications between scale-related governance and conflicts between social and ecological resilience. For, example for the poor in Africa, social resilience can be increased temporarily by exploiting ecological capital. Cumming concluded that the resilience perspective helps describe and understand root causes and system dynamics in Africa.

Marco Janssen (Arizona State University) presented his recent research thinking on the 'robustness' of social-ecological systems. He drew on his experience of research on the conceptual theory of social institutions to give an alternative perspective. Janssen questioned whether researchers could identify the institutional configurations that maintain the functioning of social-ecological systems within a particular variability regime, and whether these adaptations increase vulnerability of the system to change. His research on robustness (generally used for designed systems) explored formal and informal rules in use. Many types of institutional arrangements (transhuman, nomadic) have adapted to spatial variability of rainfall for example. Resource systems with mobile resources (fisheries, pastoralism) and resource systems that build infrastructure (e.g. irrigation systems) were identified as important. Janssen argued that privatization leads to a mismatch of social and ecological dynamics. He added that systems might be resilient yet fragile where, for example, a system is adapted to a particular variability regime it will not cope well with effects of globalization. Furthermore, there will be tradeoffs (e.g. resilient to frequent variability yet vulnerable to infrequent extremes) and these may be most evident in African institutions where there are diverse ethnic groups, transboundary conflicts and questions of the 'nation state'.

The final presentation in the session was given by **Carl Folke** (Beijer Institute, Stockholm Resilience Centre) on the adaptive governance of social-ecological systems. He argued that environmental issues are development issues and erosion of ecosystem resilience increases the likelihood for ecosystem shifts, with consequences for livelihood and societal development. This may shift the resilience of the couple social-ecological system from a

desired to a less desired state in terms of capacity to generate natural resources and ecosystem services. Folke suggested there are critical transitions (or regime shifts) in this 'interdependent' world, where complex adaptive systems interact across scales. Such transitions represent new challenges for governance and management in relation to socio-ecological systems and ecosystem services. Folke argued that this research frontier should be debated and explored.

Folke described multi-level adaptive governance as an approach for managing transformation in social-ecological systems. This includes preparing for change, identifying the window of opportunity, then navigating the transition and building resilience in the new direction. He suggested that transition pathways depended on actors involved, bridging organizations and the level of capacity to manage change. Actors and actor groups that take part in navigating transitions, help to develop and retain a social/collective memory of ecosystem management in the face of change. Bridging organizations performing essential functions in creating effective responses to change, and enhance vertical and horizontal integration and social learning.

Summary of discussion

Ian Scoones (IDS) wished to emphasise the points raised in the first presentation by Emily Boyd, especially that the academic concepts of resilience to date had not adequately incorporated dimensions of power, political economy, conflict or choice. He argued 'thresholds' were a political issue and development processes themselves were contested. Furthermore, he raised concerns that collective actions were not adequately addressed in ecological models, which tend to use implicit individualist behaviour. He felt that it was important that researchers help to clarify the question of resilience for whom. Dan Brockington (IDPM) added that the discussion focus on specifics; researchers need find a 'language' to clearly explain to policy makers how resilience adds to the debate of sustainable development in Africa.

Eric Lambin agreed that an understanding of politics and power are essential, and added that this was especially the case in the example of Kenya he used in his presentation. However, he felt that interdisciplinary scientists are well aware of the socio-cultural issues, having a background in both the social and natural sciences. He noted that in short discussions, complex issues do tend to become generalised and anecdotal, but argued that most interdisciplinary researchers are working with detailed projects and address all aspects of how a system changes or responds to perturbation within their research on resilience. Essentially, he reminded participants that resilience is able to deal with multi-stressors and the interactions (dynamics), as well as the process of emergence (transformation and change). He felt that the problem within discussions on resilience is that ideas are communicated in an abstract way (to policy makers and 'social scientists' and the challenge is to draw out resilience in practice so that the observables can be communicated in a more concrete way.

Lenart Olssen (Lund University) argued that there should be a symbiosis in applying resilience because social-ecological systems are coupled, that it is not about 'the social' or 'the ecological' being more important than the other is. Although others disagreed, he suggested that ideas about resilience were different to sustainable development and questioned whether concepts of resilience could be applied in practice to social systems

because social systems focus on change, while resilience in ecological systems implies resisting change. He added that when the presenters from different disciplinary backgrounds offered their interpreted definitions of resilience, they referred to the parts of the definition of resilience that fitted this (suggesting that there were biases in interpretation).

Several participants rebuked Olssen's interpretations. In response, Keith Lindsay (EDG) felt that the resilience approach is not about resisting change but rather about managing change, about keeping options open and therefore helping policy makers manage uncertainty. He argued that managing resilience required promoting change and diversity. He agreed that resilience is key to understanding the types of interlinked response to 'change' in coupled/complex systems, and this means that there are central questions, which should be of interest to policy makers. For example, what is important to system identity (of social and ecological linked systems) and how is it possible to identify when change has occurred (i.e. to a new resilient state) or a system has changed identity? In particular, he emphasised that discussion should not focus on what aspects of the resilience approach constrain development pathways, as management that supports resilient pathways should encourage or protect change (i.e. resilience is about change and so is development??).

Graeme Cumming, also in response to Olsson, argued that preserving identity in ecological systems does not preclude change, and management of the natural environment is also value-laden and about transformation. He clarified that while a system can have 'identity', there can still be change (this is not the same as continuing to support a maladaptive society for example) because, in a resilient system, the society might be able to maintain its identity but be doing something completely different (e.g. what will happen with 2 degree rise in temperature in parts of Africa to agriculture or pastoralism etc). He recommended that participants not get side-tracked by the semantics in complex systems theory (or the 'resilience' approach) because, as it is one of many approaches in development in Africa, it will be difficult for people from interdisciplinary backgrounds with deep rooted perceptions to agree. Cumming suggested that there is a need to advance ideas about how or whether to build on the positive attributes of the resilience approach in development to help manage transformations in fragile/vulnerable social-ecological systems (will this be a selective process for example).

Emma Tompkins (ECI Oxford) commented that there is a fundamental issue about whether resilience is an outcome or an approach. She felt that it was an approach or process of change and that 'stability' does not mean resistance. She reminded participants that all the presenters had used variations of an agreed approach based on different components of stability, self-organisation and learning, which suggests that there is some agreement.

Carl Folke emphasised that resilience is a useful approach to help explain change and continuity in development and that it should not be seen as a 'new' idea but an addition to previous approaches (e.g. livelihoods, sustainable development, ecological models etc). There is a critical need to deal with explicitly linked systems but to date scientific thinking has not achieved this. He felt that it was important to try to use science to understand complex coupled systems. The resilience approach helps to formalise thoughts about complex coupled systems but should not be used as an academic debate on the semantics as problems will always exist about interdisciplinary perspectives.

However, Jochen Hinkels (PIK-Potsdam) went on to question how the theoretical dimensions of resilience are guiding our ideas and suggested researchers need to approach the issue in a normative way. He argued that the reason that resilience is not clear when communicating ideas to policy makers is because researchers have difficulty linking observations and theory.

In response, John Colvin (Environment Agency) suggested that the metaphor is normative and that there needs to be a two-way process about what policy makers and those close to practice understand as resilience – that some researchers should move away from the semantics and make practical links for development.

Lindsey Gillson (University of Cape Town) commented on the issue of thresholds raised by Ian Scoones. She reminded participants that understanding thresholds was key to ‘managers’ and collaborative research in South Africa had helped to identify management goals for ecological resilience.

Heike Schroeder (Tyndall Oxford) commented on the conceptual links between vulnerability and social learning in the literature, and noted that risk and danger are important for stimulating change and adaptation.

Tendayi Kureya (FANRPAN) noted that, from a practitioner’s perspective, the term vulnerability has been more commonly used, particularly as a method for assessment. However, he believed this interest on vulnerability makes it difficult to connect in a positive way with communities because it focuses on the negative. He hoped that communities themselves might agree better with the language of resilience in that it offers hope and brings positive aspects of building adaptive capacity for the future. It is the ‘flip side’ of vulnerability so for researchers both are important to resolving local problems.

Session 2

Resilience depends on scale: what has meaning in measurement?

The goal of the second session was to draw on case study evidence to highlight questions on the cross-scale dimension of resilience, especially the implications and usefulness of scale measurements on targets. The session focused on the problem of measurement and indicators when complex systems are constantly transforming and different approaches reach different conclusions. The session also aimed to move beyond semantics and the global change debate to consider the national-local level. The session was chaired by **Graeme Cumming** (University of Cape Town).

The first presenters, **Tom Downing** (SEI Oxford) and **Jochen Hinkel** (PIK-Potsdam), summarised the links between the conceptual aspects of vulnerability and resilience, in particular linking actors, time and scales.

Lindsey Gillson (University of Cape Town) presented research with Kristina Duffin on managing African savannas for resilience, and whether thresholds of potential concern can be measured. She described a savannah as a mixed grassland matrix, with varying densities of trees and shrubs, and explained the process of woodland-grassland transitions. The research considered only outlined one aspect of resilience (the ability of a system to absorb disturbance without shifting to an alternate stable state), thus thresholds were a focus (where thresholds are the point between alternate stable states in regimes within ecological or social-ecological systems). Gillson summarised evidence from research in the Kruger National Park. Current management goals in the park aim to adopt strategic adaptive management, acknowledging that there is a need to make conservation management decisions when knowledge is imperfect. This dilemma requires recognition of spatial and temporal complexity of adaptive systems, participative learning by all stakeholders and clear, process-orientated management goals. Gillson argued that it is useful to consider thresholds of potential concern (or the monitoring endpoints to guide management decisions). She outlined the links between ecological thresholds and management thresholds, where it is important to determine if normal “background” variability can be distinguished from unprecedented change or degradation. Gillson presented results from palaeoecological research, which helps to identify critical ecological thresholds (where dramatic ecosystem changes occurred) over history. The methods could translate long-term vegetation change to the modern landscape context in estimating minimum and maximum woody cover. The approach is adaptive, supporting management decisions in a changing environment.

Henny Osbahr (Tyndall Centre Oxford) presented lessons from multi-disciplinary research in southern Africa on rural livelihoods, resilience and development. She outlined how dimensions of climate phenomena were characterised and related to recognition and lived experience of risk and uncertainty by rural communities. The research used features of resilience theory to determine social ability to absorb shocks, self-organise, and innovate and learn to manage livelihood disturbance. The research sought to identify which processes, institutions and types of agents characterize engagements that facilitate livelihood adaptation. She discussed the importance of livelihood coping strategies, using informal institutions and wider adaptations in livelihood strategy. The processes of interactive scalar engagements

between the different institutions, policy, social networks and agents defined the research results. The process of adaptation is essentially competitive and social-ecological resilience depends on the scale of measurement. Osbahr illustrated this with an example of cross-scale agricultural initiatives in Mozambique and specific mechanisms that facilitate successful adaptation. Applying principles from resilience theory showed that the development process was able to boost social-ecological resilience to climate change in the agricultural sector in Africa.

Jon Lovett (University of York) presented a think-piece on the problems and progress of 'measuring conservation', in particular ideas of biodiversity and ecosystem resilience in Africa.

Discussion

Inevitably, the discussion raised more questions than solutions. Participants discussed pathways of development and questioned how society would know if it were on the right one? Indicators or targets of improvement - e.g. MDGs - are different from creating latent/adaptive capacity. Multidimensional assessments may capture livelihood change but what is 'resilient design' for livelihood pathways? Might this include redundancy, diversity, flexibility and adaptability? Participants also discussed the value of thresholds and measures of resilience and most felt that the focus should be processes and proxies within the system. Ian Scoones reminded participants that there is a 'tyranny of false confidence' in science because different thresholds will have different consequences for different stakeholders.

Graeme Cumming commented that resilience theory is useful for understanding slow variables e.g. sustainability of soils, where human attitudes change slowly for uptake into management. Using complexity theory, it is not important if there is ambiguity in the system. Anneli Ekblom agreed with the role of complexity theory and drew attention to the evidence in the presentations. Lindsey Gillson added that it is important to know what managers want from the transition – whether this is local communities or government – and in the case of her work, managers for Kruger National Park. The research had identified management goals and exposed the problem to all the drivers affecting change. John Colvin commented that it depends who is seen as the rightful managers.

Jochen Hinkel suggested that researchers focus on normative objectives and then look at concepts that help. Whether the transition is good or bad depends on values and from a scientific point of view the identity of the system is more important. Tom Downing commented that every actor in the system has her own values and knowledge which cannot be separated from the system itself – i.e. things are constantly in transition rather than stable (seen as identity). Maria Carmen Lemos noted that not all these actors may be interacting however as it is difficult to get all those involved in a decision consulted – she argued that although adaptive capacity may be difficult to explain, policy makers need something better than cost-benefit analysis and concepts. It is important that ideas become available for practice in a way that is helpful. Carl Folke added that the presentations illustrate how institutions can be encouraged to build latent capacity, which society can then draw upon, and what characteristics improve options. He suggested for example that bridging institutions are critical. Researchers need to turn their evidence into practical communication for policy makers and practitioners; in particular, not only creating abstract discussions or

new structures but also supporting institutions that already play a bridging role. Essentially, better tools need to be developed within research on social-ecological risk because those managing resources need to have practical ways of responding to uncertainties. Tendayi Kureya noted that there are limitations to using vulnerability assessments for example, and his organisation has been helping to develop better tools (e.g. useful to the aid agency World Vision in Africa).

Discussion concluded with recognition that resilience theory is useful for measuring feedback mechanisms, understanding change in slow variables and setting goals for inevitable thresholds. However, there was less agreement on which scale is important for which stakeholders at what stage in the pathway.

Session 3

Using 'resilience' to promote sustainability in development practice

The final session was chaired by **Frances Stewart** (Queen Elizabeth House Development Studies, Oxford). The session sought to discuss whether resilience is key to successful environmental management or an important concept that is difficult to apply in practice. Are ideas about resilience analytically useful or is it inherently difficult to assess complex socio-cultural, especially within historically embedded settings. For example, finding convening indicators for resilience in human systems, which allow comparison of communities across different time horizons, can be difficult as institutions promote and limit adaptive capacity to different groups and at different scales. What are the best applications of resilience ideas to support managing uncertainty in socio-ecological systems? For example, is this a theoretical approach, a tool or an opportunity to influence policy?

This challenge could be more effectively communicated to policy makers. However, policy makers also have different perceptions of resilience and often have as much difficulty communicating what is relevant to their different responsibilities. The purpose of the final session was to offer a forum for discussion between scientists, policy makers and NGOs. In particular, participants were asked to consider the role of resilience in practice, the gap between scientific resources and delivery, and multi-level governance. There were additional questions about the trade offs for long term goals and whether justice, resilience and sustainability are linked.

Three interlinked presentations were given to stimulate discussion. **Ian Scoones** (STEPS IDS) offered his thoughts on 'resilience in the drylands – power, policies and practice'. He emphasised the pastoral drylands are characterised by uncertainty because of high spatial and temporal variability, non-equilibrium dynamics and complex socio-ecological-economic systems. Particularly influential drivers of uncertainty are climate change, economic integration and conflict. In this context, resilience is an emergent property and requires embracing change.

New research from STEPS IDS (with Andy Stirling) considers 'dimensions of uncertainty' and recognises there are different knowledges of the processes and outcomes. The dimensions are risk, ambiguity, strict uncertainty and ignorance. Scoones argued that all these dimensions should be considered by scientists and policy makers but, to date, research has been heavily focused on risk, assuming risk is dangerous. While science is still uncertain and people are increasingly looking to frameworks for adaptive management or governance, this assumes outcomes are known. For example, what if there are alternative outcomes that we do not yet know, or that there are changes in value-judgements. Scoones argued that essentially ambiguity in trajectories of change is a problem. He questioned the process by which agreement on the best pathways, and therefore politics or policy, are reached. Different users will have different values and therefore different indicators. In the 'real world' there are elements of ignorance and surprise. Scenarios provide options for future pathways; political science has not yet contributed to discussions about resilience and the implications of different pathways.

Scoones suggested that discussion about resilience is useful to negotiate the trade offs that will have to be addressed about the future of pastoralism in Ethiopia, for example. It is an opportunity to 're-imagine' development and development pathways. The discussions create a deliberative space for policy makers and researchers in the transition to a more flexible framework. This has been especially difficult for policy, which remains hardwired into creating blueprints and predicting cost/benefits. But how can the culture and practice in planning and development, their administration structures/modalities and for NGOs become more adaptive, more flexible and allow for surprise? What would a resilient design for practice look like? He suggested that it include (1) normative positioning of values and framing (whose voice counts?) (2) better governance arrangements (especially autonomy and legitimacy) (3) flexible appraisal processes, and (4) consideration of redundancy, diversity, flexibility and adaptability in design features.

Polly Ericksen (GECAFS) gave an insight into resilience, food systems and food security practice in southern Africa. She began by highlighting findings from research on food security, where, in modern systems, many of the feedbacks are now masked or distorted. She suggested that buffering capacity arises from diversity (among assets and at multiple levels) and that adaptive management requires monitoring and learning by institutions (or adaptive governance). Ericksen illustrated the structure, function and process using an example of pastoralist food insecurity from Northern Kenya. She claimed the adaptive capacity of pastoralists was slowly being eroded by multiple stressors, poor early warning systems and institutional weakness. Solutions lie with investing in local institutions, diversifying livelihoods and stimulating economy.

Building resilience in food systems in Africa is a major challenge. Ericksen reiterated Scoones point that the 'resilient state' is not always a desirable state as it depends on who decide what is desirable (i.e. pastoralists or government). However, managing for disturbance using a resilience approach is in conflict with the current donor paradigms (with little long-term planning, cross-scale support, trust or accountability and many fragmented efforts). Ericksen argued that policy makers cannot assume social and ecological resilience move in the same direction thus raising questions for managing future dynamics and uncertainty (e.g. food production increases while diversity decreases; savannah biomass increase but not pastoralist food security, problems of substitutions and social dynamics replacing biophysical in globalized systems). Ericksen felt that one aspect of the resilience approach that is particularly useful to practitioners is the way it can highlight cross-scale tradeoffs. This highlighted different options for 'rural worlds' and raised many issues, including food security for the wealthy (cash crops) often at cost to the poor in Africa (periodic food crises and drought), food miles or fair miles (distortion of the trade system), social protection/investment and economic growth, questions of responsibility and poverty, role of diversification unclear in the long-term, competing demands on water, and finally what food security means as a value judgment.

Ericksen concluded by highlighting how the resilience approach builds on current approaches to managing complexity and heterogeneity in food systems. Areas that need better understanding by practitioners and researchers are: cross-scale interactions, adaptive management in practice, improving communication of how the resilience approach is useful to practitioners trying to manage complex transformations and contested outcomes.

Tendayi Kureya (with Lindiwe Majele Sibanda) (FANRPAN - Food, Agriculture and Natural Resources Policy Analysis Network) followed with a presentation focusing on one driver (HIV/AIDS) on agriculture and food security in southern Africa and how this has affected practitioners' attempts to support long-term resilient livelihoods. He felt that the numerous definitions of vulnerability have hindered practice and felt that it is reassuring that there was more agreement over definitions of resilience. Kureya used an example of research from seven SADC countries during 2004 that quantitatively measured household vulnerability (Household Vulnerability Index HVI). He outlined the HVI methodology that considered vulnerability to HIV/AIDS shocks and the severity of impact on rural households using data from 1930 households. The study found evidence that traditional targeting of the vulnerable was largely inaccurate because some households do not meet rigid criteria. Marginalization occurred because decisions have been value-laden. The tools need to be more flexible and help put figures on complexity for household circumstances and multiple stressors. The HVI approach is now being used for targeting, monitoring and evaluation and has potential across the SADC region. The approach allowed tracking of households and for equitable use of limited resources.

Discussion

The discussion that followed these three linked think-pieces focused on the concept of different 'rural' worlds where there were issues of cross-scale trade-offs, marginalization, negotiation and specialisation were relevant. The real-life complexities for practitioners means there must be multi-dimensional targeting but in the bigger picture how can NGOs for example measure everything about rural livelihoods in Africa. It was agreed that there should be flexible tools but disagreement about who should be targeted? Practitioners had adopted the concept of vulnerability because it had assessment tools that were easy to apply. Beatrice Crona suggested that participants read a recent article by Kinzig et al (*Ecology and Society* 11 (1) 20, 2006) which discusses resilience and regime shifts, with specific reference to assumed cascading effects.

Craig Castro (Oxfam) raised the problem of understanding vulnerability within communities, and how to define between different communities. He wondered if resilience can help us to design tools to design better strategies for practitioners to use (for example, when using wealth ranking in the context of high poverty, assessments are problematic because people who need to be targeted (to build adaptive capacity) are often left out). He questioned how researchers could help build a more integrated response in practice to support transitions. Castro illustrated the idea of different resilient states using the example of Zambia where informal coping mechanisms still support people yet many are trapped in poverty. He was concerned that the academic interest in different 'values' might be a recipe for paralysis for practitioners and policy makers, as this would always be the case.

Graeme Cumming responded with the hope that researchers can develop resilience theory to be useful in practice because it allows for decision-making in ambiguous situations. He added that resilience theory helps to define the slow variables that have a big impact on where the systems sits but are difficult to assess or manage, which would help to set management goals through a process of stakeholder agreement, as had been the case illustrated by Lindsey Gillson's study in Kruger.

Carl Folke agreed with Castro that it is time to move beyond semantic discussions and make theory useful to practitioners, policy makers and communities because there are maladaptation traps from long term feedbacks to short term solutions that society didn't think through (e.g. is it already too late for example with climate change?). He felt that social scientists needed to engage with these issues to help with the overview of how to apply resilience in practice.

Erik Millstone (SPRU University of Sussex) agreed that researchers had role in helping to combine cynicism with optimism. He felt that it was not helpful to suggest that the options were 'plasters or revolution' (keep going as we are or a major transition) because how will policy makers be able to tell at the beginning of change process what will really happen (resilience). For example, the GM crop movement was amazed at its collective ability to transform governance and corporate structure.

Maria Carmen Lemos (University of Michigan) disagreed because she believed that this dichotomy was not meant to imply that policy makers do neither. If society builds adaptive capacity the result could be to get a transformation or 'flip' to a better stage (e.g. less poverty) and she argued that research has a role in helping to think through positive synergies for a goal better than the situation in many African countries than we have now. She agreed with Castro that the debate would reach paralysis and not help practitioners who still have a goal with their everyday work.

Summary of themes arising from the meeting

The meeting concluded with reflections from Fiona Miller (Stockholm Environment Institute) and Emma Tompkins (James Martin 21st School, ECI).

Miller concluded that the open discussions highlighted how the areas of resilience, adaptation, and vulnerability are fertile and dynamic areas of interdisciplinary research. One of the biggest challenges however is taking this enormous amount of knowledge into policy and practitioner domains. She identified five key emerging points from the discussions.

1. There needs to be greater **engagement between resilience thinking and social theory**, particularly contributions from political ecology, political economy and development studies in order to address issues of social differentiation, marginality and vulnerability. For instance, resilience stresses the positive ecological role of diversity, but in a social sense we need to better explore the role of diversity, such as the value of pluralism, diverse perspectives and ontologies in the decision making arena.

2. The challenging issue of **politics and power in resilience** was much discussed, highlighting that resilience is not an objective concept or state when discussing social-ecological systems. Whilst we may see resilience in an ecological sense as positive, when discussing resilience of social-ecological systems we need to consider resilience within the goals of sustainable development or improvements in human wellbeing. Consideration of politics and power needs to come into the way we formulate research partnerships and research questions, for unless we begin to identify diverse values, appropriate policy windows and opportunities, and appropriate ways of communicating at this level we will not be effective in supporting resilience. She noted that in her work at SEI, an applied policy research institute, it is crucial to **engage early with partners and policy**, and to support long-term partnerships, to work towards joint problem definition in the research process.

3. **Resilience and desired states** was another theme that came out of the discussions. This theme relates to ‘realities’, one of the three topics for the workshop, as desired states are very much connected to people’s realities. Through a focus on resilience of desired states we need to make our assumptions and normative goals more explicit. This came through in our discussion of: thresholds, and how these differ in terms of ecological and social thresholds; collective versus individual level resilience, as some individuals’ resilience may decline even though the community-level measure of resilience may improve; multiple stresses; immediate versus future risks; and quantitative and qualitative thinking. The point was made that resilience is not just about good science, but also good political processes. As such, wider discussions of governance issues such as transparency, legitimacy, accountability, and subsidiarity in decision-making needs to be brought into resilience thinking.

4. A number of speakers spoke about **practically applying resilience**. Resilience is intrinsically an attractive concept – being able to bounce back after shock, or rather, being able to re-organise after a shock, is something that is attractive to policy makers. Resilience is in many ways a positive concept, where as vulnerability is a rather negative concept and can be associated with passivity and victimisation. Resilience can stress the agency of people,

highlights how people are motivated to lift themselves out of situations, to improve their capacity to respond to surprise.

Despite the challenges associated with practically applying resilience a number of speakers identified some possible ways forward:

- Scale of analysis needs to be made more explicit, yet at the same time the cross scale interactions need to be taken into account. Research in the area of resilience has been most successful in understanding resilience at local, ecosystem, landscape or regional levels; vulnerability research has also been successful in progressing our understandings of social systems. However, we can often miss the wider scale processes, structures and systems that can undermine resilience or construct vulnerability at a given scale. A focus on bridging organisations is a promising area of new research.
- Exploring the processes that support flexible pathways ('pathways of manoeuvrability') is another promising direction, highlighting the important role of networks, relationships, learning and local institutions. However, it was stressed that we need to be careful not to romanticise traditional institutions as these can reflect power structures that may in themselves undermine resilience.
- Diversification of livelihoods and strategies is also seen as a promising way forward, however, we also need to address this issue with caution, as there is an assumption livelihood diversification is a positive thing and this can sometimes neglect exposure to market risks, lack of appropriate institutions to support diversification etc.
- Other exciting areas relate to the value of targeting different groups and identification of thresholds of potential concern, yet there needs to be consideration of these in terms of quantitative and qualitative methods of analysis.

5. Need to remember that **resilience is just one tool in our conceptual toolbox**. The strength of resilience as a concept is that it helps us to better understand societies' relationship to change, both slow and rapid. Associated with these processes of change is an eventual redistribution of costs and benefits of development, the creation of new opportunities and costs will be distributed unevenly in society, time and space. Negative impacts however can be identified, anticipated and addressed. Ecological resilience is different to social resilience and this is qualitatively different to *social-ecological resilience*. Once we think in terms of social-ecological resilience we can consider the *relations* between social and ecological systems, the 'coupledness' of socio-ecological systems thus avoiding (or minimising) the society-environment dichotomy. A focus on feedbacks allows us to better explore these relationships. One of the problems with globalisation is that these feedbacks are now looser and less clear, particularly in the case of food and commodity chains. The challenge is to more clearly articulate these feedbacks, so that negative feedbacks can be responded to. However, once we consider feedbacks and responses we return to this issue of agency. Generally, it is assumed that people have the agency to respond once they observe a negative feedback. However, this is where we need to engage more with vulnerability research and social theory, as work in this area allows us to better understand agency, and how agency has its limits and can be constrained by wider structures.

Miller also suggested that participants think about one last question ‘from your own experience, what are some of the most promising areas where resilience thinking has or can better engage with policy and practice at different levels to support sustainable development and improvements in well-being?’

Emma Tompkins noted that the workshop discussion had raised questions about the limits to using ‘sustainability’ as a goal in development because of its different meaning to different people and suggested that equitability in society may not be the same as building resilient societies. Tompkins believed that there should be a ‘no regrets’ approach when dealing with uncertainty, but she questioned notions of different types of development, asking if economic development is important, what should be the focus for investment? She noted that managing transformations requires goals and that most existing institutions to manage change are not effective.

Final discussion from participants

A number of participants raised the issue of climate change adaptation as missing from the workshop discussion and whether policy makers should see it be a separate agenda. There was concern that researchers needed to communicate their ideas in a clear way given the radical potential of the resilience approach to help policy and practice. In particular, it was thought that there should be engagement in a more direct way with African researchers given new patterns of aid to support South-based knowledge development from DFID for example. It was noted that research messages often get confused (e.g. in Africa - desertification, climate change adaptation, development, etc). Jochan Hinkel commented that there was a danger of researchers discussing the semantics but not communicating the knowledge and experience that scientists have to support practice. He felt there should be more effort at learning from experience to date, to describe cases with common set of terms, and ensure that do not generate a whole new set of language. Social scientists added that there needs to be more engagement with the development studies agenda to check the messages, and help engage in local-level communities fighting for their rights. John Colvin agreed but added that there also needs to be a dedicated space for continuous dialogues with policy makers to make progress. There will need to be efforts made by researchers to construct this dialogue because from the donor perspective there is currently ambiguity in how to make policy that considers the long-term or complex ‘real-life’ problems.

However, some participants believed that it was worth reframing terminology. Maria Carmen Lemos argued that from the perception of the South, many terms used in development carry negative baggage, for example within adaptive capacity and modernisation theory. Climate change has provided an opportunity to reframe the problem with participation of the South because many of these researchers already have close ties with policy makers, universities or communities. Graeme Cumming added that researchers also ask how policy contributes to resilience – policy is not evolving fast enough to deal with major challenges – while Carl Folke added that resilience theory can help with learning about scale interactions and how short-term adaptations can have feedbacks decades later.

Annex 1: List of Participants

	Surname	Name	Organisation	Email
1	Ashlin	Alison	OUCE Oxford	alison.ashlin@ouce.ox.ac.uk
2	Ashley	Paul	Mott MacDonald Consultancy	paul.ashley@mottmac.com
3	Boyd	Emily	James Martin/ECI	emily.boyd@ouce.ox.ac.uk
4	Breman	Elinor	ECI Oxford	elinor.breman@ouce.ox.ac.uk
5	Brockington	Dan	IDPM University of Manchester	daniel.brockington@manchester.ac.uk
6	Castro	Craig	Oxfam GB (Pretoria Office)	ccastro@oxfam.org.uk
7	Cavanna	Sue	SOS Sahel	suecavanna@sahel.org.uk
8	Crona	Beatrice	Stockholm Resilience Centre	beatric@ecology.su.se
9	Cumming	Graeme	University of Cape Town	graeme.cumming@uct.ac.za
10	Daley	Patricia	OUCE Oxford	patricia.daley@ouce.ox.ac.uk
11	Downing	Tom	SEI Oxford	tom.downing@sei.se
12	Eklblom	Anneli	ECI Oxford	anneli.ekblom@ouce.ox.ac.uk
13	Ericksen	Polly	GECAFS/ECI Oxford	polly.ericksen@eci.ox.ac.uk
14	Folke	Carl	Stockholm Resilience Centre	calle@ecology.su.se
15	Gale	Julie	The Environment and Development Group	jgale@edg.org.uk
16	Gillson	Lindsey	University of Cape Town	lindsey.gillson@uct.ac.za
17	Gordon	Line	SEI/Stockholm Resilience Centre	line@ctm.su.se
18	Hinkel	Jochen	Postdam Institute for Climate Impacts	hinkel@pik-postdam.de
19	Janssen	Marco	Arizona State University USA	marco.janssen@asu.edu
20	Jennings	Steve	Oxfam GB	StJennings@oxfam.org.uk
21	Jerneck	Anne	LUCSUS	anne.jerneck@ekh.lu.se
22	Kureya	Tendayi	Consultant, FANRPAN	tendayi@developmentdata.co.zw
23	Kuruppu	Natasha	ECI Oxford	natasha.kuruppu@ouce.ox.ac.uk
24	Lambin	Eric	University of Louvain Belgium	lambin@geog.ucl.ac.be
25	Lemos	Maria Carmen	University of Michigan	lemos@umich.edu
26	Lindsay	Keith	The Environment & Development Group	klindsay@edg.org.uk
27	Liverman	Diana	ECI/OUCE Oxford	diana.liverman@eci.ox.ac.uk
28	Long	Peter	University of Bath	p.r.long@bath.ac.uk
29	Lovett	Jon	University of York	JL15@york.ac.uk
30	Castro	Craig	Oxfam GB	
31	Malhi	Yadvinder	OUCE Oxford	yadvinder.malhi@ouce.ox.ac.uk
32	Mayer	Anne-Marie	Action Against Hunger	annemariemayer17@yahoo.co.uk

33	Miller	Fiona	SEI Stockholm	fiona.miller@sei.se
34	Millstone	Erik	SPRU Uni Sussex	e.p.millstone@sussex.ac.uk
35	Minohara	Akane	Oxford (St Antonys)	akane.minohara@sant.ox.ac.uk
36	Mortimore	Mike	Drylands Research Centre	mikemortimore@compuserve.com
37	Olsson	Lennart	LUCSUS	lennart.olsson@lucus.lu.se
38	Osbahr	Henny	Tyndall/OUCE Oxford	henny.osbahr@ouce.ox.ac.uk
39	Parr	Kate	ECI Oxford	kate.parr@ouce.ox.ac.uk
40	Prowse	Martin	ODI	m.prowse@odi.org.uk
41	Roberts	Timmons	James Martin/ECI Oxford	timmons.roberts@ouce.ox.ac.uk
42	Sallu	Susannah	OUCE Oxford	susannah.sallu@geog.ox.ac.uk
43	Schroeder	Heike	Tyndall Oxford/ECI Oxford	heike.schroeder@ouce.ox.ac.uk
44	Scoones	Ian	IDS	i.scoones@ids.ac.uk
45	Shepherd	Andrew	ODI	a.shepherd@odi.org.uk
46	Shimada	Shuhei	Kyoto University	shimada@jambo.africa.kyoto-u.ac.jp
47	Stewart	Frances	QEH Oxford	frances.stewart@qeh.ox.ac.uk
48	Tengo	Maria	Systems Ecology, Stockholm	mtengo@ecology.su.se
49	Thompson	John	IDS	j.thompson@ids.ac.uk
50	Tompkins	Emma	ECI Oxford	emma.tompkins@ouce.ox.ac.uk
51	Virah Sawmy	Malika	OUCE Oxford	malika.virahsawmy@jesus.ox.ac.uk
52	von Heland	Jacob	Dept of Systems Ecology, Stockholm Uni	jacob.heland@ecology.su.se
53	Woodhouse	Philip	Manchester IDPM	philip.woodhouse@manchester.ac.uk