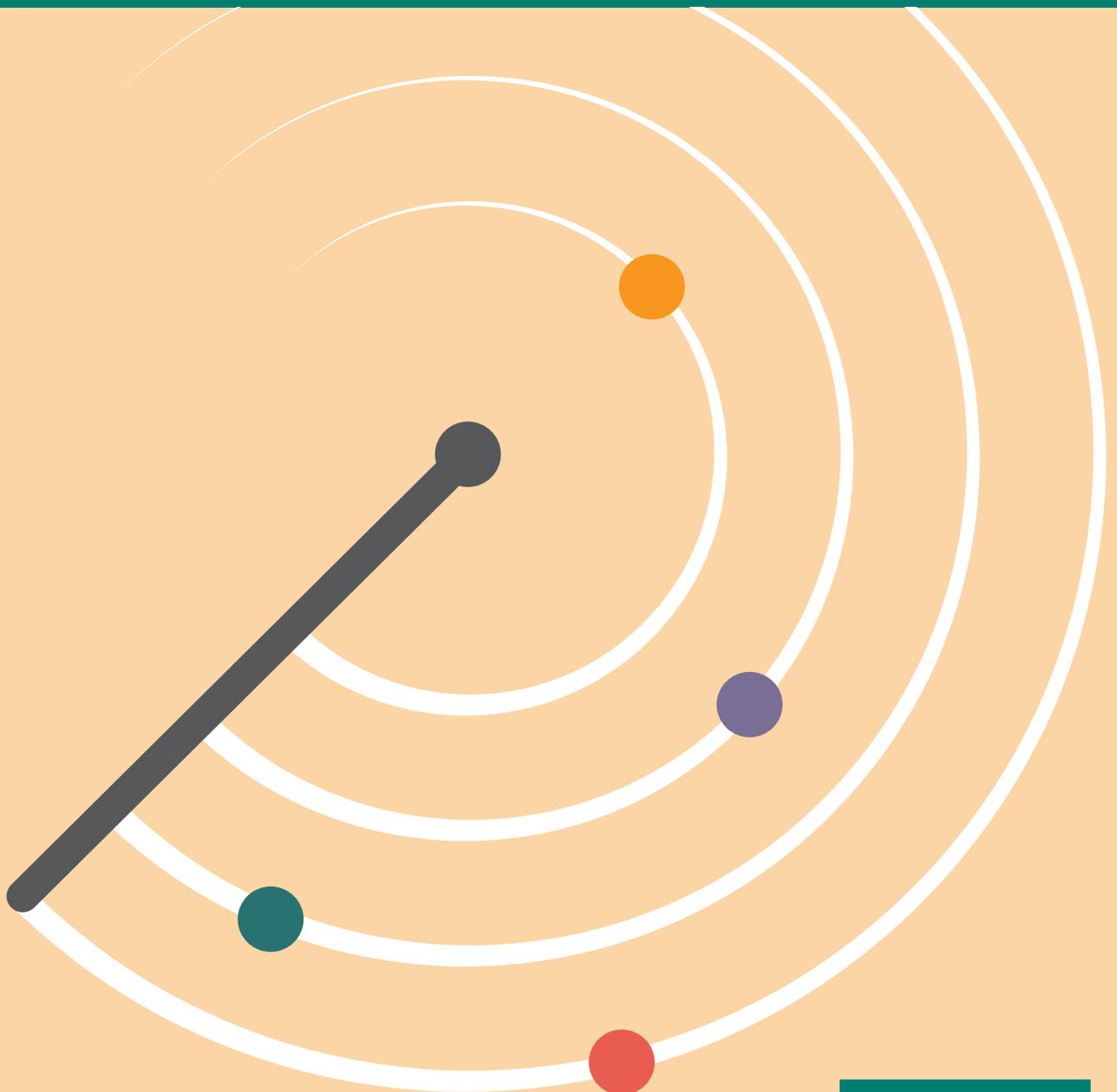




Resilience scan | 2014

A review of key 2014 literature, debates, social media, blogs and events on resilience

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REPORT

This report was written by Thomas Tanner, Aditya Bahadur, Catherine Simonet, and Hannah Betts. We gratefully acknowledge the inputs of resilience experts including: Samuel Carpenter (IFRC), Richard Friend (ISET), Natasha Grist (ODI), Maggie Ibrahim (World Vision International), Jim Jarvie (Mercy Corps), Simon Levine (ODI), Marcus Moench (ISET), Katie Peters (ODI), Jo da Silva (ARUP), Harjeet Singh (Action Aid) and Tim Waites (DFID). Our thanks also to Bethany Martin-Breen and Kevin O'Neill for helpful feedback.

This 2014 scan will be followed by updated quarterly scans through 2015, complemented by four 'deep dive' analytical papers focused on emergent aspects of resilience thinking and practice. The initial deep-dives are focusing on measurement of resilience, and on understanding and incorporating aspects of personal resilience in wider resilience building efforts.

Please see www.odi.org/resilience-scan for details of these papers and previous resilience scans.

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Abstract

The resilience revolution that has spread through international development policy and practice continues apace. The concept has been able to draw together actions and people working across a wide range of sectors and contexts. Much of the emerging literature is focusing on testing and refining operational approaches to resilience, although challenges remain in turning some trickier resilience concepts, such as interdependent systems and complexity, into practice. A major component of the operational challenge is the need for measurement of resilience inputs, processes and outcomes, and this is reflected in the growing range of frameworks and metrics available. The main critiques of resilience centre on its general failure to engage with power and politics in resilience building processes and outcomes.

This 'resilience scan' summarises the latest developments in thinking and practice in the field of resilience, focusing on the context of developing countries. Covering the literature and debates from 2014, it contains a set of summaries focused on:

1. Insights from renowned resilience experts
2. A review of academic literature from 2014
3. Recommended blogs and twitter feeds
4. A calendar of key resilience events.

The scan will be of interest for those implementing resilience projects and policies, seeking summaries of debates about resilience thinking, and those seeking guidance on where to find the latest blogs, opinion-pieces and events.

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Executive summary

The ‘resilience revolution’ that has spread through international development policy and practice continues apace. This report is the first of a set of quarterly ‘resilience scans’ on the latest developments in thinking and practice in the field of resilience, focusing on the context of developing countries. Covering the literature and debates from 2014, it is based on a set of summaries focused on:

1. Insights from renowned resilience experts
2. A review of academic literature from 2014
3. Recommended blogs and twitter feeds
4. A calendar of key resilience events.

Three key emerging themes recur throughout the scan and are marked with icons to allow readers with a specific interest in these areas to jump to the most relevant sections of the report.



Operational approaches to building resilience



Measuring resilience



Politics, power and resilience

Headline findings of the scan include:



Attempts to understand how resilience concepts can be operationalised are proliferating

These include devising strategies to enhance resilience in diverse geographic contexts, including regions, countries, cities, communities and households. They examine the range of potential elements (e.g. rights, resources, planning) that can support resilience to varied disturbances (e.g. heatwaves, floods, food price shocks) to improve outcomes, as well as the range of appropriate governance arrangements to do so (e.g. decentralising water policy, or measures in places of good governance versus post conflict or fragile states). Overall, resilience has moved into the mainstream, especially through international cooperation programming and funding. While conceptually-based operational approaches are growing, so is the looser use of resilience as a generic concept to integrate different sectors and endeavours, or simply as a ‘find and replace’ for adaptation or disaster management.



A huge effort is underway to measure, evaluate, test and gauge resilience across a range of disciplines

This ranges from efforts to provide qualitative resilience characteristics (e.g. good governance, rights, investment climate) to devising complex formulae for numerical values of resilience. There is a tension between creating measurement proxies that are more case-, and hazard-, specific and those that are cross-comparable. This measurement effort is likely to escalate in 2015 due to growing levels of resilience-centred projects and programmes, and due to the development of targets and indicators for the three big international policy processes on disasters, Sustainable Development Goals and climate change. These must be underpinned by more precise definition and relating the role of resilience in contributing to wider development objectives such as growth, citizen empowerment, good governance, poverty reduction or reduced inequality.



Research and practice on resilience thinking has taken a ‘political turn’

Many research papers argue that greater engagement with politics and power is vital to enhancing resilience. Some focus on the distributional consequences of resilience building actions, and on ensuring benefits for, and inclusion of, the poorest and most vulnerable citizens. Others outline the pitfalls of adopting a less politically-aware and more ‘technocratic’ approach to applying the resilience concept, enabling the term to be co-opted into particular narratives to further specific goals or benefit particular groups (e.g. more than one author discusses how displacement of communities on the pretext of adaptation and enhancing resilience can be used to transfer land to powerful actors).

Resilience is being approached as a more mobilising, less defensive concept

There is a discernible shift in writing, programming and funding mechanisms towards the ability to ‘sell’ resilience as firstly, embodying citizen mobilisation and engagement, secondly, strengthening wider capacities for tackling dynamic shocks and stresses, and thirdly, as an activity providing significant development co-benefits (echoing the ‘Resilience Dividend’ concept). At the same time, many note that the evidence base remains fairly weak, especially over longer timescales.

Operational approaches to resilience, especially complex and interdependency are still needed

A key gap in operationalising resilience thinking is the limited attention to complexity, uncertainty and interdependencies as part of resilience building processes. Some of these complexities and uncertainties arise from the interdependencies between parts of the system, some from the politics inherent in all social systems, some arising from the individual and subjective decision-making logics that can propel or undermine the resilience of vulnerable individuals and wider communities/systems. One way to take this further might be to bring together different areas of resilience practice, such as those working in urban contexts and those examining food security. Enhanced interaction can lead these growing but potentially separate communities of practice to explore common challenges, opportunities and to learn from each other’s successes and failures.

Review of the 2014 Resilience Literature

Our examination of research articles on resilience published in 2014 in eight overlapping fields reveals the breadth and depth of emerging resilience literature. Headlines from these fields include:

- **Climate change:** These papers describe vulnerabilities of specific areas to climate change-induced disturbances, pathways of building resilience, the political economy of climate change-induced displacement and components of successful adaptation and resilience strategies.
- **Disasters:** This literature examines strategies to enhance resilience to disasters, suggesting methods of measuring resilience, and critiques ‘resilience’ as a disaster management strategy due to its lack of engagement with politics and power.
- **Food security and agriculture:** Papers in this domain outline ways of measuring resilience to food shocks and examine methods of promoting agricultural resilience.
- **Conflict:** These articles explore how risks from environmental change and armed conflict combine to determine vulnerability and argue that the relationship between climate change and conflict has been analysed too simplistically to date.
- **Water:** Here the focus is on the development of indicators for measuring resilience and on dynamics of water governance that enhance resilience.
- **Urbanisation:** One group of authors emphasises the importance of considering issues of inclusion, rights and power when examining pathways of building urban resilience. A second group lays out the components and elements of urban resilience. A third group presents methods and modalities of building resilience.
- **Infrastructure and resilience:** Key issues in this domain include post-disaster reconstruction, economic metrics of measuring infrastructure resilience and the value of resilience in the sustainable management of the built environment.
- **Economic resilience:** Papers can be broadly divided into two categories – those covering measurement of resilience and those that emphasise the importance of engaging with politics and power for dealing with economic shocks.

The full reference list can be found at the end of document, with 5 recommended readings that include:

Anguelovski, I., Chu, E., Carmin, J. (2014). Variations in approaches to urban climate adaptation: Experiences and experimentation from the global South. *Global Environmental Change*. 27, pp. 156-167.

Bahadur, A., and Tanner, T. (2014). Transformational resilience thinking: putting people, power and politics at the heart of urban climate resilience. *Environment and Urbanization*. 26 (1), pp. 1-15.

Khan, F. (2014). Adaptation vs. development: basic services for building resilience. *Development in Practice*. 24 (4), pp. 559-578.

Vivekananda, J., Schilling, J., Smith, D. (2014b). Understanding resilience in climate change and conflict affected regions of Nepal. *Geopolitics*. 19, pp. 911-936

Welsh, M. (2014). Resilience and responsibility: governing uncertainty in a complex world. *The Geographical Journal*. 180 (1), PP. 15-26.



1. Insights from resilience experts

This section provides a summary of trends in resilience-related thinking and practice based on a review of 2014 literature (summarised in more depth in section 1) and feedback from 11 international resilience experts. It also highlights some of the contemporary debates and possible future directions for 2015. We would like to gratefully acknowledge the inputs of the following people for their feedback: Samuel Carpenter (IFRC), Richard Friend (ISET), Natasha Grist (ODI), Maggie Ibrahim (World Vision International), Jim Jarvie (Mercy Corps), Simon Levine (ODI), Marcus Moench (ISET), Katie Peters (ODI), Jo da Silva (ARUP), Harjeet Singh (Action Aid), Tim Waites (DFID).



From theory to practice: operationalising resilience

One of the main trends observed through this scan is the expansion of operational approaches to building resilience. While academic articles and debate are certainly proliferating, resilience has also taken off as a strategic approach and objective in many parts of the world. The conceptual roots of such operational approaches are evident from socio-ecological systems, disaster response and economic development in particular, and resilience is increasingly the main framing concept in efforts to, variously, adapt to climate variability and change, manage disaster risks, enhance food security, respond to humanitarian emergencies and manage urban development. Along with the Rockefeller Foundation, international development agencies have been at the forefront of driving this surge in popularity.

This operationalization is itself beginning to be reflected in academic debates, as case studies and empirical examples are increasingly used to underpin new thinking and challenges to existing resilience thinking. One expert described this heightened debate as a ‘creative churn’, but it is not without tensions. Some operational approaches to resilience

are informed by specific concepts from resilience theory, yet practitioners feel frustrated by the absence of operational guidelines related to many conceptual ideas, for example in areas such as complexity or interdependent systems (see below). For example, the emergence of transferable toolkits such as the OECD Guidelines for Resilience Systems Analysis or the Rockefeller Foundation/ARUP City Resilience Framework have built directly on conceptual resilience principles.

Many other operational and policy contexts are using resilience in a looser, more generic sense, in terms of safeguarding long-term development progress from shocks and stresses. The term is also becoming a more readily understood shorthand term for climate adaptation or disaster risk reduction. While this has appeal in so far as it brings together diverse sets of actors, institutions and objectives, it risks resilience becoming a largely meaningless buzzword, or become easily co-opted to further existing political ends (see the section on the ‘political turn’ below).



Measuring resilience

Growing operational approaches and the development of streams of funding for resilience have increased the attention paid to unpacking and measuring resilience, something our Resilience Scan 2015 deep dive analysis is tackling in greater depth. Much of this effort is focused on creating a standardised or transferable set of resilience components and accompanying measurement indicators. Strategic resilience indicators are also emerging at the organisational level to strengthen integration, coherence, and learning, exemplified by the *Resilience Marker* in the EU’s ECHO humanitarian actions. While one expert questioned whether a ‘build back better’ requirement might distract humanitarian actions from post-crisis management, others saw such markers as crucial to mainstreaming resilience thinking across strategies and

operations within organisations. Some programming approaches are wary of common indicators, recognising that approaches to building resilience will vary with context. Some programming, such as the BRACED programme, are approaching resilience through a theory of change perspective, measuring resilience through the impact of interventions. Certainly, 2015 looks set to be a year of new and innovative approaches to M&E in the context of resilience, including through integrating and scaling up personal and subjective information (see below).



A political turn in resilience thinking

The move into the mainstream for resilience approaches has led to a growth in deeper analytical exploration and critiques. One argument is that the widespread generic use of the term ‘resilience’ results in it being stripped of its more radical or innovative ideas, echoing similar de-radicalisation of the sustainable development concept. As a result, and reflecting concerns about transferring the resilience concept from ecological to

social contexts apolitically, there is growing interest in the role of politics and power in mediating resilience processes and outcomes. There is growing evidence that such use of the term in the generic sense risks co-option of the resilience concept to fit prevailing narratives and ways of working. This is reflected in the views of experts as well as the literature scan, and includes concern that the narrative of resilience might be used as a tool for powerful interests to capture resources and perpetuate urban inequality (reflecting *Tom Slater’s blog*), through land acquisition following emergencies, for instance, or by delivering difficult policy reforms such as forced migration. There is also a need to learn from past approaches and past failures so that resilience can deliver genuine systemic change that empowers and benefits poor and marginalised people. This requires greater political economy analysis and a political lens on vulnerability and resilience. Broadly, these concerns relate to a growing need to accept that resilience projects or changes made in the name of resilience create winners and losers. Our understanding of resilience, therefore, needs to be more concerned with power relations and politics, root causes of vulnerability and the processes of policy and decision making trade-offs and distributional outcomes.



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Resilience as an integrative concept

Many experts cited the value of, as well as potential pitfalls of, resilience as a concept that can bring together disparate actors and goals. Resilience has created a bridge between previously poorly connected sectors, particularly those of climate adaptation and disaster risk reduction, set within a wider international development context of the Sustainable Development Goals. This is crucial in a year when all three areas are negotiating new international policy frameworks, with associated targets and indicators. The danger in widening resilience to encompass multiple sectors and goals is that its definition and operation become so differentiated as to become meaningless.

Tackling complexity, uncertainty and interdependence

A number of experts note the limited attention to and understanding of complexity, uncertainty and interdependencies. This includes furthering our understanding of how different elements of the same system (e.g. different infrastructure components) are interconnected and interdependent. One expert highlighted this complexity citing our tendency to characterize general components of resilience that are independent of the nature of the hazard. Instead, factors building resilience to some hazards may in fact exacerbate vulnerability to others, such as the existence of close domestic and social networks that are usually good for resilience being the same factors that exacerbated the spread of Ebola or other infectious diseases. Understanding these interconnections and trade-offs are central to learning how to work within complex systems.

Networking global links across the resilience landscape

While one of the strengths of resilience thinking has been the emphasis on bringing together diverse actors and sectors, the 2014 scan drew attention to three missing areas of networked action. First, there is a need for greater development and ownership of the resilience concept within and by actors in the Global South. Academic activity in particular is dominated by Western researchers, with actors in developing countries having limited influence on the emerging agenda. Second, although the UNFCCC negotiating text increasingly refers to resilience, the meaning or interpretation of the term is not explained, instead being used generally as the outcome of adaptation actions. Creating potential opportunities for UNFCCC negotiators to explore the concept and

its relationship with both climate adaptation and greenhouse gas mitigation). Finally, while resilience practice has been emerging within a number of key areas, including urban development, food security, disaster management and humanitarian action, there remain few structured opportunities for sharing of lessons learned across these areas of practice. The range of resilience research conferences and events is growing (see Events section), but bilateral meetings that might explore more operational issues are limited. For example, there may be considerable value in a structured dialogue between resilience experts in domains where resilience experience is more advanced, such as food security and urban planning.

Personal resilience and psychological wellbeing

Although the literature scan did not include the vast literature on personal resilience and psychological wellbeing, it is apparent that ideas from the field are beginning to inform wider resilience thinking and practice. This includes personal resilience to shock events and creeping stresses, such as heatwaves or gradual temperature rises, and how personal wellbeing relates to resilience in wider social systems. There is also increasing attention in climate adaptation literature on individual decision-making logics and personal contribution to adaptive capacity, which could also have direct relevance for resilience approaches. Based on this emerging area, a Resilience Scan deep dive analysis will look into these developments to explore the potential for measuring and collecting data on subjective resilience in order to guide and inform resilience policy and programming.

2. Review of resilience literature

Our examination of research articles on resilience published in 2014 in eight overlapping fields reveals the breadth and depth of emerging resilience literature. Despite narrowing our initial search to eight fields of policy and practice, we returned 1672 papers. Application of the literature search methodology and systematic exclusion parameters described in Annex 1 then yielded 63 papers deemed highly relevant to resilience thinking and practice in the context of the Rockefeller Foundation and other international programming. Key issues, debates and evidence were condensed into short reviews across the 8 domain categories.

2.1 Climate change and resilience

Climate change and resilience: At a glance

- Papers that focus on the local level largely describe the vulnerabilities of specific geographic areas to hydro-meteorological disturbances and then outline pathways/strategies for building resilience.
- National level analyses predominantly examine methodologies of assessing the impacts of climate change on countries as well as plans aimed at tackling these impacts.
- Papers that attempt cross-contextual and regional analyses engage with the political economy of displacement and propose methodologies for calculating the cost of adaptation and resilience.

Almost half of the papers analysed in the scan explore resilience in the context of climate change. These are grouped together below on the basis of the different scales of enquiry employed.

Analysis at the local level

Papers that focus on examining issues around climate change and resilience at the local level largely describe the vulnerabilities of specific geographic areas to hydro-meteorological disturbances and then outline pathways/strategies for building resilience. Typical of this approach is the article

by Forster et al. (2014) that examines the sources of risk and vulnerability for fishing communities in the Caribbean, and highlights opportunities for adaptation and resilience building that include the adoption of strategies like livelihood diversification. Similarly, Kafumbata et al. (2014) highlight the critical importance of inland lake systems to the lives and livelihoods of communities and outline the manner in which population pressure and climate variability is undermining the resilience of these systems. The article finally goes on to provide an overview of diverse strategies, plans and policies that have been deployed to enhance resilience, such as the establishment of new institutions, new partnerships between stakeholders and the integration of sustainable natural resource management with livelihoods.

Adewole et al. (2014) drill down even further to describe the impacts of a flood on the campus of the University of Ibadan, Nigeria and the subsequent actions undertaken to enhance resilience to similar incidents in the future. Sharma et al. (2014) extend this local perspective, using the empirical context of drylands in Rural Kenya to identify factors that make resilience and adaptation policies successful. These include strengthening decentralisation, supporting existing autonomous adaptation strategies and developing systems for governing common property resources. An interesting piece by Khan (2014) stands out from these papers as it deploys econometric analysis to study the impacts of flooding in communities along the Indus river in Pakistan. Khan demonstrates a positive relationship between access to basic services (education, water supply, etc.) before a disaster and a community's ability to effectively recover from flooding. As such, this paper helps highlight pathways of resilience to flooding that also have positive impacts on livelihoods and poverty alleviation. Finally, Megersa et al. (2014) is another technical piece that also does not neatly align with most papers in this category. The article examines the impact of climate change on pastoral cattle production in Southern Kenya and studies the dynamics of livestock diversification as a response.



Analysis at the national level

The papers that focus on climate change and resilience at the national level predominantly examine methodologies of assessing the impacts of climate change as well as plans aimed at tackling these impacts. Rai et al. (2014) and Mason (2014) engage with themes of planning and assessment to underline varied political-economic contextual complexities that need to be taken on board during these processes. Mason (2014) discusses the interaction of climate and conflict risk to argue against a simplistic, technocratic paradigm of planning that focuses on reducing risk from these two disturbances. Rai et al. (2014) examine two main funding instruments for tackling climate change in Bangladesh and find that a firm grasp of political-economic issues is essential to the success of any instrument for planning and financing adaptation. For example, the authors explain how

two mechanisms had objective criteria for funding but, in reality, disbursement was dependant on a range of unofficial political considerations. Ranger et al. (2014) look at planning by reviewing 250 aid projects funded through official development assistance (ODA). The authors then demonstrate the need for climate proofing a number of these investments using options that range from transforming the project design to building flexibility within projects to ensure that they can adapt to changing conditions.



Analysis at the cross-contextual, regional and international levels

Of the three papers that attempt cross-contextual and regional analyses, two engage with the political economy of displacement and migration. Wrathall et al. (2014) and Arnall (2014) look at widely



different geographical regions to examine the manner in which displacement and migration are often posited as necessary corollaries of climate impacts and as effective strategies to build resilience, but also often function as tools for powerful interests to capture resources. Wrathall (2014) provides case studies from Peru and Honduras to explain how migration was projected as the primary viable alternative for adaptation, which led to the transfer of land from indigenous inhabitants to external, financially powerful actors. The third paper (Dale et al. 2014) looks at the manner in which emerging social resilience concepts can translate into improved Social Assessment/Social Impact Assessment (SA/SIA) practices that inform regional-scale adaptation. It argues that SAs and SIAs can be valuable instruments for integrating resilience into development.



Three cross-scale papers scrutinise the approaches, components and issues key to ensuring successful adaptation and resilience. Biagini (2014) reviews 92 adaptation projects financed through the Global Environment Facility, the Least Developed Countries Fund, the Special Climate Change Fund and the Strategic Priority for Adaptation to identify 10 types of adaptation activities. These range from capacity building and planning to the installation of physical infrastructure and warning or observing systems. This overlaps with Oberlack and Eisenack (2014), who provide a list of issues that act as barriers to allowing communities in informal settlements to adapt to climate change (e.g., ill-defined rights, limited resources, inadequate municipal planning). The paper then demonstrates that these issues determine resilience, and that solving them through international cooperation will help enhance the ability of a community to deal with shocks and stresses. Similarly, Moench (2014) also proposes broad factors that determine resilience across contexts-systems, agents, institutions and exposure.

Stigler et al. (2014) is an outlier, as it proposes as an alternative methodology for calculating the cost of adaptation and resilience to counter the USD 100 billion/year figure currently being discussed in international policy circles.

2.2 Disasters and resilience

Disasters and resilience: At a glance

- Papers examine ways of enhancing resilience to disasters- this includes analysing the role of communication in disasters, looking at the pathway of resilience for LGBT communities and analysing the manner in which the tourism industry can engage with concepts of resilience better.
- Methods of measuring resilience are proposed by papers in this category through reviewing existing methods of calculating loss from disasters and through the proposal of a socio-ecological status index for measuring resilience.
- Papers also critique 'resilience' as a strategy of engaging with disasters by examining it as a form of governmentality' (control through procedures and practices).

The papers that examine resilience as a response to disaster risk are fewer in number than those focused on climate change but touch upon similar themes. This set of papers examines strategies to enhance resilience to disasters and suggests methods of measuring resilience and vulnerability; one paper provides an insightful critique of 'resilience' as a strategy of engaging with disasters.



Roux (2014) focuses on the critical importance of 'communication' as a key strategy to enhance the effectiveness of disaster response/recovery and build resilience. This paper shows that better communication reduces uncertainty in strategic decision making and ensures that disaster management goals align with stakeholder expectations. Dominey-Howes et al. (2014) present a different perspective on building resilience to disasters by demonstrating the manner in which sexual and gender minorities, or lesbian, gay, bisexual, transgender/transsexual and intersex (LGBTI) populations are systematically overlooked in enterprises of disaster resilience, despite their greater vulnerability to disasters (e.g., due to their lower economic or marginalised status). Lew (2014) presents his views on the manner in which the tourism industry can benefit from a clearer engagement with concepts of resilience. He argues that the industry currently considers resilience only as a response to economic shocks, but that resilience has a lot more to offer in terms of dealing with a range of creeping changes that can have deleterious impacts on the industry-providing a perspective on resilience that is relevant beyond just tourism.



Two papers, Lazzaroni and Bergejik (2014) and Estoque and Murayama (2014) discuss the measurement of resilience and vulnerability. The former critiques existing methods of calculating loss from disasters, while the latter presents a methodology for developing a socio-ecological status index to measure resilience (using indices such as the Human Development Index, the Good Governance Index, the Climate Hazard Index, etc.). Joseph (2014) examines the EU’s approach to building resilience as a form of ‘governmentality’ (control through procedures and practices) that aims to encourage local responsibility so that direct foreign intervention in crises is deemed less necessary. Joseph argues that this is because resilience approaches consider problems such as conflict and food security as generated not by external conditions or the wider international environment, but more as internal matters of governance and self-reliance.

2.3 Food security, agriculture and resilience

Food security, agriculture and resilience: At a glance

- Methods of measuring resilience to food/livelihood shocks are proposed by papers in this category- this includes examining attributes and dimensions of livelihood resilience and principles for the robust measurement of resilience.
- A number of papers in this category also examine methodologies of promoting agricultural resilience and resilience to food/livelihood shocks.
 - This includes an examination of the potential of agroforestry in enhancing resilience, the importance of engaging with multiple stakeholder groups and the potential for a greater amount of congruence between food security policies and policies aimed at fisheries governance.



Six papers touch upon the issues of food security and agriculture with reference to resilience. Speranza et al. (2014) and Conostas et al. (2014) outline ways of measuring resilience to food insecurity. The former identifies the attributes and indicators of the dimensions of livelihood resilience: buffer capacity, self-organisation and capacity for learning. It then looks at ways of making resilience more operable by presenting a range of factors that contribute to these three capacities, including natural and financial capital, institutions and

structures of learning (Speranza et al. 2014). Conostas et al. is a highly insightful piece (2014) that offers principles of measuring resilience against food insecurity (e.g., the importance of measuring the resilience of a particular development outcome), key themes for measurement (e.g., measurement being geared to specific types of shocks and stressors) and features necessary for robust resilience measurement (e.g., indicator sets tailored to particular local contexts).



McConney et al. (2014), Ratner et al. (2014) and Mulugeta (2014) examine methods of promoting agricultural resilience and resilience to food/livelihood shocks. Mulugeta (2014) highlights the manner in which agroforestry practices can enhance the resilience of food systems (e.g., through trees that sustainably support nitrogen fixation) and promote the use of agricultural land as carbon sinks (because trees absorb a larger amount of carbon as compared to food crops). Ratner et al. (2014) draw on detailed case studies from Cambodia to demonstrate how an innovative methodology for stakeholder engagement, the appreciation-influence-control (AIC) model, built a shared understanding of the sources of vulnerability in fisheries livelihoods and catalysed collective action to support resilience. McConney et al. (2014) approach the issue from a different perspective by arguing for a greater congruence between food security policies and policies aimed at fisheries governance. They posit social networking, self-organisation and adaptive capacity as three elements of resilience that can help bind these policies together into an integrated approach for reducing the impact of food shocks in the Caribbean.



Sage (2014) provides a more transformational tack, arguing that civic mobilisation around growing food for direct consumption can have a number of concomitant effects on building resilience, reimagining society and perhaps even “...becom[e] a means for building worlds beyond capitalism.”

2.4 Conflict and resilience

Conflict and resilience: At a glance

- Papers discuss the manner in which risks from environmental change and conflict combine to determine vulnerability.
- Articles also argue that the relationship between climate change and conflict has been analysed too simplistically to date and provide insights into activities that reduce vulnerability to conflict as well climate change to deliver a double dividend of resilience.

A number of articles that touch upon the themes of conflict, violence and security have been discussed in the preceding sections, but two more specific papers by Vivekananda et al. warrant attention. Vivekanda et al. (2014) examine how risks from environmental change and conflict combine to determine vulnerability in three of districts of Nepal. The authors then review various strategies to build resilience in this complex environment and provide an interesting analysis of some unintended consequences of these seemingly well intentioned approaches. For example, one such strategy entailed the provision of rice to conflict-affected households that were also food insecure.



This increased food security but also created local preferences for rice that cannot be met sustainably in the long term. Another paper argues that the relationship between climate change and conflict has been analysed too simplistically (Vivekanda et al. 2014b). The paper demonstrates that instability, inequality and poverty make communities vulnerable to climate change as well as conflict. This then leads to an understanding of how engaging with these factors can lead to harnessing a ‘double dividend’ of resilience where a similar suite of activities can help engage with both sets of disturbances (provided local, contextual factors are taken into account).

2.5 Water and resilience

Water and resilience: At a glance

- In this category, papers are mostly focussed on the development of measurement indicators for resilience to water scarcity spanning institutional, economic, behavioural, ecological, physical, emotional and natural factors.
- The decentralisation of water governance is also examined as a strategy for enhancing resilience to water scarcity.



Of the four papers that examine issues of resilience in the context of water policy, three focus on exploring measurement indicators for resilience. Chan (2014) suggests indicators of disaster resilience in the context of a river basin in five broad areas: science and technical, built environment, organisations and institutes, social-economic, and natural environment. Li et al. (2014) focus on gauging the resilience of urban areas based on ecological sensitivity, water quality and vegetation cover. Maleksaeidi (2014) develops indicators for measurement of resilience of socio-ecological systems under water scarcity that include cognitive, emotional, behavioural and physical aspects.

A fourth paper (Hordijk et. al. 2014) analyses the dynamics of decentralising water governance. It explores the degree to which such changes in governance arrangements reveal a move towards resilience, transition or even transformation. It uses a range of case studies to demonstrate the manner in which inserting a discussion on rights, deliberative democracy, participation and equality can transform the management of water services to enhance resilience.

2.6 Urbanisation and resilience

Urbanisation and resilience: At a glance

- Papers emphasise the importance of considering issues of inclusion, rights and power when examining pathways of building urban resilience.
- Papers propose the components and elements that come together to deliver resilience in urban areas. This includes the role of factors such as information, municipal financing and risk assessments.
- Papers also present methods and modalities of building resilience. This includes issues such as adaptive governance, enhancing ecological knowledge, co-management of resources, developing multilevel social networks and mainstreaming climate information in planning.

Papers that focus on issues of urbanisation and resilience engage with three main themes. One group of authors emphasises the importance of considering issues of inclusion, rights and power when examining pathways of building urban resilience. A second group lays out the components and elements of urban resilience. The third group presents methods and modalities of building resilience.



From the first group, Seeliger and Turok (2014), Bahadur and Tanner (2014) and Anguelovski et al. (2014) all underline the importance of the participation of diverse stakeholders in any process of building resilience in cities. Bahadur and Tanner (2014) use a case study from the Rockefeller Foundation-funded Asian Cities Climate Change Resilience Network (ACCCRN) to demonstrate the manner in which deep community engagement with processes of resilience building can transform the manner in which vulnerable communities engage with disturbance. Seeliger and Turok (2014) find similar evidence in the context of an informal settlement in Stellenbosch, South Africa. Anguelovski et al. (2014) use cases from Quito, Surat and Suban to find that strong political leadership, departmental engagement, municipality wide institutionalization, and continued stakeholder involvement are integral to sustaining adaptation planning and resilience building programs over the long term.



Ajibade and McBean (2014), Rumbach (2014), Bahadur and Tanner (2014) and Barros et al. (2014) emphasise the fact that cities suffer from structural inequities that drive vulnerability and inhibit the resilience of a vast number of urban citizens. Ajibade and McBean (2014) use a political ecology framework to show that limited access to housing and weak housing rights are two crucial factors that drive vulnerability among the urban poor in Badia, Nigeria. Rumbach (2014) uses a case study on Salt Lake, Kolkata in India to highlight how new developments in this area have enhanced the resilience of wealthy citizens but overlook the vulnerabilities of the traditionally marginalised. Barros et al. (2014) locate their analysis in Maputo, Mozambique to demonstrate how the legacy of urban settlement during the colonial era persists. More specifically, they highlight the manner in which a colonial pattern of settlement where European colonisers inhabited certain parts of the city (that were more resilient) and the colonised inhabited another (that was more vulnerable) is reproduced: instead of the colonisers and colonised, the duality is now between the rich and poor. Bahadur and Tanner (2014) also touch upon the issue of structural inequities by highlighting the importance of considering the manner in which 'caste' mediates resilience and adaptive capacity.



Three papers that fall into the second group present components and elements of resilience to lay out a pathway for vulnerability reduction, adaptation and building resilience in urban areas. Villagara et al. (2014) argue that 'open spaces' have a critical, positive effect on a city's resilience because these provide temporal refuge, information, goods and medical care among other survival needs in times of crisis. Johnson and Blackburn (2014) focus on the engagement of a number of cities with UNISDR's Making Cities Resilient Campaign, and map the manner in which cities have improved the institutional and administrative framework for the governance of disaster risk reduction (for e.g., by establishing disaster management agencies and engaging multiple stakeholders in decision making). The paper also investigates sources of finance for urban risk reduction, such as stand-alone budgets on DRR from municipalities and mainstreaming financing into city budgets and budgets for development projects.

Additionally, the paper provides examples of cities that have conducted multi-hazard risk assessments and the nature of risk reduction infrastructure being installed in cities. The paper concludes by proposing four components that make cities resilient: resistance, coping capacity, recovery and adaptive capacity. Wamsler and Brink (2014) also describe four actions that help cities to adapt: hazard reduction and avoidance, vulnerability reduction, preparedness for response and preparedness for recovery. Apart from this, the study highlights the manner in which flexibility (the number and diversity of measures that address the risk factors that cities face) is a key determinant of resilience.



Four papers present methods and modalities of building resilience. Boyd and Juhola (2014) discuss how climate change poses new challenges to towns/cities and underline the importance of new, flexible forms of governance. The authors then go on to propose tenets of a flexible, ‘adaptive governance’ approach for urban contexts that include building ecological knowledge, co-management and leadership, multilevel networks and modes of governance, and

strategies for coordinating and managing surprise. Similarly, Stein and Moser (2014) propose a ‘bottom up’ method of developing adaptation strategies based on a community-led asset planning approach. They suggest that this approach can prove more effective than top-down methods based on climate models and scenarios and should be mainstreamed into urban governance to enhance the resilience of towns and cities. Karanth and Archer (2014) draw on the ACCCRN initiative to discuss the merits of a city-level ‘Climate Change Trust’ as a novel governance mechanism to enhance urban resilience. Finally, Jabeen (2014) discusses spatial practices that determine the places that women and girls inhabit in the built environment, examines the impact of climate change on these and outlines adaptive measures.

Three papers do not align with the themes above. Mohammad (2014) looks at damage from an extreme rainfall event in Bida, Nigeria and highlights the inadequacies of current disaster recovery activities. A discursive and conceptual piece by Childers et al. (2014) compares the value of theoretical frameworks derived from the concepts of sustainability, resilience, adaptation and vulnerability to study urban transitions. Jaroszweski et al. (2014) examine challenges and opportunities for measuring the resilience of urban transport systems to climate impacts.



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2.7 Infrastructure and resilience

Infrastructure and resilience: At a glance

- Papers in this category largely examine the manner in which post-disaster reconstruction can enhance resilience.
- Other issues covered in this category include the value of deploying the concept of resilience for the sustainable management of the built environment and an analysis of potential metrics of measuring infrastructure resilience.

Most papers that examine infrastructural issues have been discussed in the context of the preceding themes. Therefore, this section will examine three papers that remain. Yi and Yang (2014) undertake a review of the literature on post-disaster reconstruction (PDR) to highlight the manner in which research outputs in this domain have multiplied five times in the past decade; half the articles analysed issues particular to developing countries, while most research was undertaken by researchers in Western countries. The article also highlights issues that are the subject of research, ranging from stakeholder analysis and reconstruction policy to governance arrangements and issues of sustainability in reconstruction.

A more technical article by Pant et al. (2014) proposes economic metrics of measuring infrastructure resilience that include time-averaged level of operability, maximum loss of functionality and time to recovery. A third article examines the value of deploying the concept of resilience for the sustainable management of the built environment and finds that this concept, with its emphasis on multiple stable states, adds more value than existing ideas of continuity and stability currently being deployed by built environment professionals.

2.8 Economic resilience

Economic Resilience: At a glance

- One set of papers in this category underline the manner in which issues of power, politics, agendas and agency are critical to understanding the manner in which economic and livelihood systems can be made more resilient
- Another set of papers is focused on measuring and gauging economic resilience through different indices, enumerating the issues around scales of governance to be considered when measuring resilience and deriving the economic insurance value of ecosystem resilience.

Most of the papers that examine issues around economic resilience can be broadly divided into two categories - politics and power, and measurement.



First, there is a set of papers that underlines the manner in which issues of power, politics, agendas and agency are critical to understanding the manner in which economic and livelihood systems can be made more resilient. Welsh (2014) critically analyses the concept of resilience in the context of socio-economic systems to find that the concept currently demonstrates an inadequate understanding of political contexts and questions of power and inequality. Similar to Joseph (2014), the author reaches this conclusion by examining resilience as a technology of ‘governmentality’ that depoliticises socio-economic shocks and disturbances.

Another paper that is aligned with this more political thinking examines the resilience of livelihoods derived from fisheries (Nayak et al. 2014). The authors find that strengthening fisheries, reducing the poverty of fishers and enhancing resilience are not only dependant on restoring fish stocks but rebuilding social and ecological systems. They use two case studies (India and Brazil) to argue that resilience, as it is currently understood, does not pay adequate attention to power dynamics that are key drivers of poverty and vulnerability of livelihoods.

Bristow and Healy's (2014) paper argues that an understanding of human agency must be firmly part of any conceptualisation of 'resilience' in order to understand why some regional economies manage to renew themselves whereas others remain locked in decline. It seeks to infuse the existing technocratic vision of resilience with an understanding of the variable capacities of human actors to articulate shocks, make sense of their meaning and act in relation to them. As such, the paper argues that concepts of adaptive capacities and agendas are inseparable from the idea of resilience. A fourth paper, while being predominantly focused on deriving characteristics of peaceful and resilient societies, also highlights the importance of equity, rights and corruption, once again underlining the importance of power and politics (Killea 2014).



Second, there is a set of papers focused on measuring and gauging economic resilience. Killea (2014) draws on 4700 different indices, data sets and attitudinal surveys to suggest eight characteristics of peaceful and resilient societies that experience stronger economic growth and achieve greater human development. These include a well-functioning government, a sound business environment, an equitable distribution of resources, the acceptance of rights of others, good relations with neighbours, a high level of human capital, free flow of information and low levels of corruption. Osth et al. (2014) focus on critically analysing the notion of 'regional resilience' (the role of regions and of their abilities to withstand economic shock). They argue that greater attention is needed to disaggregate the spatial units that together help gauge regional resilience. In particular, the paper argues that small spatial entities such as the municipality are useful units of analysis when it comes to estimating economic resilience. Finally, a highly technical treatise from Baumgärtner and Strunz (2014) provides a methodology to estimate the economic insurance value of ecosystem resilience.

3. Recommended Twitter handles and blogs

Description and organisational affiliation (as given on Twitter profile)	Followers	Tweets	General overview of themes addressed
<p>Resilient Cities @ICLEI_ResCities Resilient Cities is the leading global forum on urban resilience and adaptation. Convened by ICLEI, the city of Bonn & World Mayors Council. ICLEI - Local Governments for Sustainability, the World Mayors Council on Climate Change, Bonn, Germany.</p>	4296	1399	Tweets on international events (UN, COP, UNEP...). Tweets on webinar and conference organisation/reports. All tweets are related to city emissions or adaptation.
<p>Tom Mitchell @tommittell_odi Head of Climate Change at ODI. Tweeting on risk management and resilience issues. ODI- Overseas Development Institute, London, UK.</p>	1467	1444	Tweets on research publications, reports, international events and the nexus between resilience and disasters/conflict. Focuses on DRR and HFA, with links to climate change and SDGs. Also tweets on ODI projects such as BRACED and PRISE. Raises questions on resilience finance and measurements.
<p>David Chandler @DavidCh27992090 Professor of International Relations, Westminster Uni. Edit: Resilience journal. Author: Resilience the Governance of Complexity. Tweets are research not news. Westminster University, London, UK.</p>	13600	914	Tweets on research papers and publications, on research conferences and on media. Focuses on CBA, climate extremes, vulnerability (fragility) and governance issues.
<p>ADRRN @ADRRN1 ADRRN is a network of civil societies that works towards building the resilience of vulnerable communities across the Asia-Pacific region ADRRN-Asian Disaster Reduction and Response Network (ADRRN), Kuala Lumpur, Malaysia.</p>	1094	1896	Tweets on DRR. Focuses on Asian countries.
<p>Stockholm Resilience Centre @sthlmresilience Advances transdisciplinary research on resilience Stockholm Resilience Centre, Stockholm University, Stockholm, Sweden.</p>	7795	3651	High number of tweets on resilience. Tweets on research issues and publications/talks. Broad approach from CBA to sectorial approach; gender and poverty nexus but also governance and policy questions, ecosystem resilience. Visualisation of resilience work.
<p>Urban Resilience @UrbanResilienc Urban Resilience - professional tools and innovative solutions for urban design, citizen engagement, and community sustainability solutions. Urban Resilience, Canada.</p>	506	1296	Tweets on the publication of the Urban Resilience Daily: most of the topics are on emission/ pollution, sustainable city and urban adaptation.
<p>CDKN @cdknetwork The Climate & Development Knowledge Network supports developing country decision-makers to design and deliver climate compatible development CDKN-Climate & Development Knowledge Network, London, UK.</p>	4751	3624	Tweets on resilience are mainly related to climate resilience. Questions on resilience; equity and exclusion, DRR, poverty reduction, SDGs and vulnerability are frequent topics. International and general focus.
<p>Sarah Rescoe @sarahrescoe Disaster resilience researcher & educator. Currently writing on social capital, psychosocial resilience, & learning and pedagogy in a digital/global context.</p>	178	563	Tweets on research and reports on resilience with social focus on social aspects and vulnerable group: Gender, Children, cultural resilience, and social capital as factor of resilience. Disasters risk reduction and disasters resilience focus.
<p>Resilience Alliance @resilience_RA Research network studying the resilience of social-ecological systems Resilience Alliance, Network</p>	962	135	Tweets on resilience from a natural scientific perspective (ecol. and soil.) as well as socio-economic aspects of resilience. Also tweets on research papers and events. Comments on data, policy, events. Multidisciplinary approach (socio-economic, ecosystem resilience, etc.).
<p>Disaster Resilience @disasterlab Bartel Van de Walle (Tilburg University) & Tina Comes (CIEM): information systems to improve sense making, support decision-makers and build resilient societies. Disaster Resilience Lab, Tilburg University, Tilburg, Netherlands.</p>	326	249	Focuses on disasters with specific reference to policy and practitioners' approaches. Also tweets on humanitarian aid and games and activities organised around disaster resilience.

3.1 Twitter

On the previous page we have identified ten key Twitter handles that discuss resilience which are representative of the various approaches of actors engaging with resilience. These range from researchers to practitioners and policy makers at various scales of analysis (community based to international), and encompass a range of accounts from the more well-known (*David Chandler* - 13600 followers) to the more specialised (*Disaster Resilience Lab* - 326 followers). While a range of search tools have been used to arrive at this list, the final selection is the result of a subjective appraisal by ODI's resilience experts and recommendations made by experts interviewed.

Some of the handles suggested specialise in one aspect of resilience, while others span various resilience related issues. For instance, *Resilience Cities and Urban Resilience* mainly tweet on urbanisation and resilience. On the other hand, the *Climate & Development Knowledge Network (CDKN)* tweets on a variety of resilience related issues including poverty reduction, climate change mitigation and adaptation. *The Asian Disaster Reduction and Response Network (ADRRN)* specialises in Asian issues, case studies, initiatives and events, while the Stockholm Resilience Centre's tweets have a global remit.

3.2 Suggested blog sites

We used a combination of recommendations by ODI and external resilience experts, a review of websites and Twitter to compile a list of 10 suggested blog sites, some linked to the Twitter handles suggested in the previous section. The key characteristics of each blog are presented here. The list below also notes the way each blog engages with the concept of resilience. Some of the blogs are specifically focused on resilience (*Resilient Urbanism*, *Strategic Resilience*), while others examine resilience in the context of poverty reduction, climate change and development issues.

1. *Resilience*: A program of the Post Carbon Institute (PCI) focussed on examining issues that determine resilience in the face of environmental, energy, economic and social crises. Includes a monthly 'resilience roundup' of news from the mainstream media.
2. *Sci Dev Net*: This website includes analysis, views and opinions on science and technology for global development. They also publish pieces on resilience as part of this.
3. *Resilient Urbanism*: This blog explores topics related to urban resilience such as housing and land challenges, equity, density, governance, construction markets, and other characteristics of the urban environment. The blog employs a multidisciplinary approach at all scales of analysis and in all time frames. The posts are related to ongoing research and the authors aim to bridge the gap between academia and practice. All the blogposts deal with resilience questions and specifically focus on urbanism.
4. *World Bank Blogs*: This site hosts many contributors, practitioners and researchers on international development. A wide range of topics related to poverty reduction and international development are addressed. Resilience is often approached from an economic point of view or through the lens of climate change and disasters.
5. *BBC Media Action Blogs*: This site considers media and communication powerful tools that can help reduce poverty and promote rights-based development. The blog hosts contributions from various advisors, consultants and freelance journalists'. Posts on resilience are mainly related to disasters and humanitarian response.
6. *The Disaster Resilience Lab*: This site is focused on disaster resilience, and the posts here aim to analyse and discuss the ability to prepare for, manage and learn from risks and crises as a prerequisite for sustainable growth in an increasingly complex, uncertain and evolving world.
7. *Resilience Science*: The contributors to this site are members of Resilience Alliance (RA), a research network of scientists and practitioners from many disciplines who collaborate to explore the dynamics of social-ecological systems. The blog is sharply focused three issues: A) the contribution to theoretical advances in the dynamics of complex adaptive systems; B) the reinforcement of theory by rigorous tests and the development of guidelines and; C) principles that assess the resilience and develop policy and management tools to support sustainable development.
8. *Strategic Resilience*: This site is hosted by PwC and focuses on the firm's activities (finance and accounting). The blog is mainly related to business resilience as a strategic approach that 'embraces preparedness, integrity and opportunity, through times of change and crisis'.
9. *Adaptiveness and Innovation in Earth System Governance*: This is hosted by the Stockholm Resilience Centre. Posts include lectures, conference summaries, article reviews and interviews of people working in the field of earth system science and governance research. The writing team consists of scholars with diverse backgrounds. This multidisciplinary approach aims to explore the role of governance, institutions, networks and organizations in building adaptiveness, and supporting innovation in an era of global environmental change.

10. *DFID Blogs*: This is a place where staff can share their personal experiences of helping to eliminate extreme poverty across the developing world. Leading voices in the field of international development are also contributors to the blog. Resilience is addressed in the context of climate change, disasters and gender issues.
11. *ODI Blogs*: The posts on resilience at this website are related to poverty reduction, water, agriculture, humanitarian policy, disasters and climate change.
12. *New Security Beat*: Blog of the Wilson Center's Environmental Change & Security Program with regular and varied posts on resilience.
13. *Open Democracy*: This is an independent, public interest, not-for-profit internet repository on articles exploring issues of rights and democracy. Carries a number of interesting blogs on resilience.

14. *China Dialogue*: Carries a number of interesting blogs on environmental issues largely in the context of china. Resilience is discussed from time to time in the context of climate change.

3.3 Recommended blog posts

Below is a list of recommended posts from these sites. While this exercise is subjective and based on the expertise of resident ODI resilience experts, the focus is on blogs that discuss resilience in the context of key global policy processes (such as those on climate change disasters) and those that had been posted in 2014. Also, an effort was made to provide conceptual coherence by focusing on three “hot topics” vis-à-vis resilience: A) questions of finance for building resilience, B) the role of information in building resilience, and C) resilience measurement and assessment.

Title and link	Author	Blog	Date	Author
Zimbabwe: Glimmers of light on dimly lit streets	H. Macdonald-Walker	DFID	17 Dec.	Infrastructure and basic services as factors for building resilience.
We Can't Delay Investing in Resilience – the Risk Is Too High	R. Kyte	World Bank	11 Dec.	Finance for resilience.
The need for smarter, better targeted climate finance	L. Del Bello	Sci Dev Net	11 Dec.	Finance for climate resilience.
Business and resilience: convergence of critical mismatch?	G. Peterson	Resilience Science	9 Dec.	Business and resilience.
Aid sector 'urgently needs' common resilience measure	M. Dobrovilny	Sci Dev Net	3 Dec.	Finance for resilience and resilience measurement.
Why We're Making a Stand for Resilient Landscapes in Lima	M. Lovei	World Bank	3 Dec.	Climate negotiations (COP 20) and resilience.
View on Poverty: Turning mobiles into emergency tools	J. Howgego	Sci Dev Net	26 Nov.	Mobiles and information for disaster resilience.
The resilience of neoliberal urbanism	T. Slater	Open Democracy		Resilience, narratives, politics, governance
Visualizations of Adaptive Governance	N/A	Adaptiveness & Innovation in Earth System Governance	12 Nov.	Resilience Frameworks, governance.
Philippines: One Year after Typhoon Haiyan: Social Protection Reduces Vulnerabilities to Disaster and Climate Risks	M. Al-Arief	World Bank	7 Nov.	Disaster resilience.
Asia-Pacific Analysis: Time for SIDS to set sail	N/A	Sci Dev Net	22 Sept.	Resilience to disasters in SIDS forum.
Cash transfers in Masisi	C. Pycroft	DFID	27 Aug.	Cash transfer for resilience.
Flooding in Nepal: how radio can save lives	B. Timilsina	BBC	14 Aug.	Role of information in building disaster resilience.
Should we measure resilience?	A. Quinlan	Resilience Science	16 Jun.	Resilience metrics and measurement.
Resilience vs. Vulnerability in African Drylands	P. Brenton	World Bank	11 Jun.	Factors of resilience and vulnerability
The resilience of neoliberal urbanism	T. Slater	Open Democracy	28 Jan	Politics and political economy
Six Myths About Climate Change that Liberals Rarely Question	E. Lindberg	Resilience	26 Nov	Political stances on climate change
How has climate politics changed since Copenhagen?	-	China Dialogue	18 Sept	The views of six women activists what has changed since the 2009 Copenhagen conference

4. Key events

This list of key resilience-related events in 2015 was compiled through a scan of key internet event sites and calendars, and suggestions from resilience experts.

Event	Organisation	Location	Date	Overview
Delhi Sustainable Development Summit	TERI	New Delhi	5-7 February 2015	Since 2001, the Energy and Resources Institute (TERI) organizes DSDS, an annual international platform that facilitates the exchange of knowledge on all aspects of sustainable development. Over the past fourteen years, it has emerged as one of the foremost forums on issues related to global sustainability. The sub-themes include 1) Sustainable production and consumption, 2) Linking MDG's to SDG's, 3) Engaging stakeholders in defining SDG's, 4) Disparities in wealth and income, 5) The science of climate change, 6) Building on COP20, 7) What kind of agreement do we need at COP21 and 8) The ethics of climate change, differentiated responsibility and poverty.
Resilient Cities Congress Asia	ICLEI	Bangkok	11-13 February 2015	Resilient Cities Asia-Pacific aims to provide a regional platform for dialogues on urban resilience and climate change adaptation and the opportunity to forge partnerships, with the ultimate goal of identifying implementable solutions and creating lasting impacts for cities in the region.
Adapting Crops to Increased Uncertainty	Current Opinion Conferences	Amsterdam, Netherlands	15-17 February 2015	Aims to study the impact of climate change on crop production and explore approaches to maintaining and increasing crop productivity in the face of climate change. Topics include 1) Increased agricultural uncertainty, 2) Sustainability of agriculture, 3) Abiotic stress, 4) Biotic stress, 5) Effects of CO2 on plant growth, 6) Resource use efficiency, 7) New crops for a new climate, and 8) Technologies for rapid crop improvement.
Global Forum for Innovations in Agriculture: Middle East and Africa Focus	Global Forum for Innovations in Agriculture	Abu Dhabi	9-10 March 2015	This conference studies innovations in agriculture that have the potential to feed the planet, offer solutions to combat global warming, provide technologies that can improve nutrition and social prosperity in developing countries, be a source of clean energy, and help us look after precious water resources.
World Conference on Disaster Reduction 2015	UNSIDR	Sendai, Japan	14-18 March 2015	Major global conference focused on framing a successor disaster reduction framework to the Hyogo Framework for Action.
International Conference on Food Security and Nutrition	CBEES	Florence, Italy	19-20 March 2015	The objective of the 2015 2nd International Conference on Food Security and Nutrition (ICFSN 2015) is to provide a platform for researchers, engineers, academics as well as industrial professionals from all over the world to present their research and development activities in the areas of food security and nutrition.
World Water Forum	World Water Forum	South Korea	12-17 April 2015	The World Water Forum is the world's largest meeting on water. The World Water Forum consists of at least three processes: the Political Process, the Thematic Process and the Regional Process, and gathers officials, legislators and local and regional authorities from more than 150 nations. Each topic is developed into a common framework of goals and concrete targets to reach in cooperation with the private sector, governments, industry, IGOs, NGOs and academic groups.

Event	Organisation	Location	Date	Overview
World Green Economy Summit	World Climate, Govt. of Dubai, WETEX 2015	Dubai, UAE	22-23 April 2015	The World Green Economy Summit (WGES) aims to pursue a dialogue on building a sustainable future by forging global partnerships that accelerate the transition to a green economy. This also aims to create strong linkages to the UN Climate Agreement 2015 through the Road to Paris and Sustainable Development Goals 2015.
CBA9: 9th conference on community-based adaptation to climate change: Measuring and enhancing effective adaptation'	ACTS, IIED, BCAS	Nairobi, Kenya	24-30 April 2015	IIED and partners such as BCAS created the CBA conferences to highlight that effective adaptation to climate change takes place at community level. A bottom-up approach to adaptation enables local knowledge and practices to be shared among communities, academics and project managers so that those most exposed to the impacts of climate change are better able to adapt. CBA9 will highlight that there are different ways of measuring the success of community-based adaptation, and underline that effective evaluation considers the perspective of both the donor as well as recipients of adaptation funding.
The European Climate Change Adaptation Conference	City of Copenhagen; European Commission (EC);	Copenhagen	12-14 May 2015	This conference is an initiative of a number of major European research projects and other stakeholders and will cover a broad range of issues related to climate change adaptation. It follows the international adaptation conferences held in Australia (Gold Coast, Queensland) in 2010 and in the United States (Tucson, Arizona) in 2012. This European conference will place a greater emphasis on understanding and assessing adaptation in action in the context of the theme of integrating climate adaptation action in science, policy, practice and business.
Energy for Sustainability 2015 - Sustainable Cities: Designing for People and the Planet	Energy for Sustainability Initiative of the University of Coimbra.	Coimbra, Portugal	14-15 May 2015	The goal of the EFS 2015 Conference is to contribute to debates on this issue by bringing together researchers and students from different scientific fields, along with other key agents in this area, allowing the exchange of knowledge, new ideas and past experiences on this pressing matter. The conference will act as a discussion forum, promoting the identification of new advances, trends and opportunities for collaboration and it is open to all persons interested in applied research and technical development in the fields of energy and sustainability, namely in the study, design, operation, and regulation of systems that generate, transport or use energy. The theme is 'Sustainable cities: Designing for People and the Planet'.
Resilient Cities 2015	ICLEI	Bonn, Germany	8-10 June 2015	This conference will look at ways of addressing urban resilience and adaptation, with the goal being to connect local government leaders and climate change adaptation experts to discuss adaptation challenges facing urban environments around the globe and forge partnerships that could have lasting impacts for cities. Key themes include: 1) Urban risk and vulnerability including risk data and analysis, 2) Adaptation planning and policy and integrated approaches, 3) Communicating resilience and applying ICT solutions, 4) Ecosystem-based adaptation and resource security, 5) Creating resilient public health systems and communities, 6) Resilient building, design and infrastructure, 7) Capacity building, Governance and Collaboration, 8) Financing resilience planning and development and 9) Other emerging themes.
Our Common Future	Organising committee with representatives from a wide range of organisations	Paris, France	7-10 July 2015	This four-day conference will be the largest forum for the scientific community to come together ahead of the 21st UNFCCC Conference of the Parties (COP21), which will be hosted by France in December 2015 ("Paris Climat 2015"). Building on the results of IPCC AR5, the conference will address key issues concerning climate change in the broader context of global change. It will offer an opportunity to discuss solutions for both mitigation and adaptation issues. The conference will also include side events organized by different stakeholders.

Event	Organisation	Location	Date	Overview
International Conference on Building Resilience	University of Newcastle, the, School of Architecture and Built Environment	Newcastle, Australia	15-17 July 2015	This conference explores the concept of resilience as a useful framework of analysis for how society can cope with the threat of natural and human induced hazards. Rising population and infrastructure, particularly in urban areas, have significantly increased disaster risk, amplified the degree of uncertainty, challenged emergency arrangements and raised issues regarding their appropriateness. Key themes: 1) Resilience, 2) Built Environment, 3) Communication, 4) Disaster Risk, 5) Slow Onset-Disaster, 6) Healthcare Facilities, Infrastructure and System Resilience Planning, 7) Social Resilience, 8) Governance, 9) Education.
9th International Conference on Urban Climate jointly with 12th Symposium on the Urban Environment	Int. Assoc. for Urban Climate & the American Meteorological Society	Toulouse, France	20-24 July 2015	The aim of this conference is to provide an international forum where the world's urban climatologists can discuss modern developments in research, and the application of climatic knowledge to the design of better cities.
Transformations 2015 – people and the planet in the Anthropocene	Stockholm University	Stockholm, Sweden	5-7 October 2015	The conference will gather people from various disciplines around the world to share research on transformations to sustainability, and explore the research frontiers in this developing field. The conference aims to build a better understanding of large-scale systems change and fundamental changes in people-planet relationships.
International Conference on Global Food Security	Cornell University	Ithaca, NY, USA	11-14 October 2015	The food security challenge will increasingly encompass the triple burden of malnutrition – under-nutrition, obesity and micronutrient deficiencies. The urgency of these issues has led to huge scientific strides in these areas, making it difficult to keep up with the rapidly expanding volume of scientific research. The Second International Conference on Global Food Security therefore aims to deliver analysis, visions and methods arising from research in a wide range of disciplines.
UNFCCC COP 21	UNFCCC	Paris, France	30 Nov - 11 Dec 2015	The objective of this conference is to achieve a legally binding and universal agreement on climate from all the nations of the world.
World Humanitarian Summit	UNOCHA	Istanbul, Turkey	23-27 May 2016	The World Humanitarian Summit will bring people and groups together to address future humanitarian challenges related to natural hazards and conflicts. Building on regional events, the summit will aim to develop stronger partnerships and seek innovative solutions to persistent and new challenges.

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Five suggested key readings are highlighted in red text.

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Annex 1: Methodology for literature search

The methodology for this literature review entailed three main steps which are described in greater detail below.

Step one: querying databases and applying primary exclusion criteria

Three academic databases – Google Scholar, Web of Science and Ingenta Connect – were identified and a list of relevant publications was collated from these. These three databases were chosen because they include papers from a variety of publishers. As such, they are considered more independent than Scopus, Web of Knowledge, ScienceDirect, Taylor & Francis Online, JSTOR and Wiley Online Library, all of which are linked to individual publishers.

The nine keywords used to search for papers in these databases were:

- Resilience climate
- Resilience disasters
- Resilience agriculture
- Resilience food security
- Resilience conflict
- Resilience urban
- Resilience water
- Resilience economic
- Resilience infrastructure.

On Google Scholar, we applied the search to the titles of papers published in 2014. The Google Scholar search was limited to the use of keywords in the title, as abstract searches are not available. Research on Google Scholar was carried out using the incognito mode of the browser in order to avoid a bias in the results obtained.

Web of Science and Ingenta Connect allowed for searches of our chosen keywords in the title, abstract and keyword sections of papers. The search was limited to 2014 and these categories were searched using the “and/or” functions provided (e.g., “resilience climate” in title or abstract or keywords).

The results of this initial search are presented in the first columns of Table 1 below. Web of Science yielded the most results, while searching with the keywords “resilience climate” yielded the greatest number of results (139 papers on average).

This first sample produced 1672 papers for analysis (including duplicates). Based on the information provided in the abstract and the title, we then went on to exclude:

- Papers with a focus or case study on industrialised/developed countries rather than low or middle income countries (as classified by the World Bank)
- Papers on ecological resilience (i.e., natural science-focused rather than socio-ecological systems)
- Papers on technological resilience (usually linked to the resilience of computer systems)
- Papers on psychological resilience (where this was not overtly linked to our search areas).

The results of the first step of this selection process are summarised in Table 1 (see below). The largest proportion of excluded papers was from *Web of Science*. This is due to the fact that the database collates papers on ecological, biological or psychological resilience without social or human aspects in this database and therefore were not directly relevant to the purpose of our search.

The keywords “resilience infrastructure” resulted in the lowest retention following the exclusion process (12% across the three databases). This is because most of the papers that contain with these keywords refer to technical aspects of resilience that had no implication for sustainable/international development.

Table 1: Search engine results by keywords and first selection

Keywords	Scholar (1)			Web of Science (2)			Ingenta Connect (3)			Average papers retained (%)
	Results	No. of papers retained	Ratio (%)	Results	No. of papers retained	Ratio (%)	Results	No. of papers retained	Ratio (%)	
Resilience Climate	156	49	31.41	130	18	13.85	130	36	27.69	23.03
Resilience Disasters	47	15	31.91	103	15	14.56	71	26	36.62	25.11
Resilience Agriculture	14	7	50.00	28	5	17.86	31	13	41.94	34.22
Resilience Food Sec.	27	16	59.26	15	4	26.67	15	7	46.67	37.53
Resilience Conflict	30	12	40.00	48	2	4.17	21	6	28.57	23.55
Resilience Urban	105	29	27.62	83	20	24.10	49	19	38.78	29.36
Resilience Water	43	10	25.58	50	12	24.00	79	14	17.72	22.43
Resilience Economic	58	11	18.97	131	17	12.98	83	23	27.71	19.88
Resilience Infra.	56	5	8.93	33	7	21.21	36	9	25.00	12.32
Total	536	154	28.73	621	100	16.10	515	153	29.71	

Step two: Assessment to gauge relevance

The second step of the review entailed a more detailed review of the 407 papers retained after stage 1. A more subjective assessment of the relevance of each paper was conducted at this stage. An ODI resilience expert reviewed the titles, keywords, abstracts and also rapidly reviewed, the introduction, conclusion and main findings of each paper to gauge:

- whether they adhered to the exclusion criterion described in step 1,
- whether the paper would be of interest to the staff of the Rockefeller Foundation (based on an understanding of the Foundation's engagement with resilience),

- whether the paper held insights that were applicable to wider contexts beyond those from which it originally sprang.

Tables 2 and 3 summarise the results of the selection process. Based on the second step of the scan the sample was slightly refined. 19.50% of the papers found with Google Scholar were retained, 16.9% from Ingenta Connect and only 10% from Web of Science were retained. The keywords "Resilience Food Security" had the highest rate of retention rate of 30%.¹

Table 2: Search engine results by keywords and second selection

Themes	Results	Step 1	Ratio of papers retained	Step 2	Ratio of papers retained
Resilience Climate	416	103	24.76	71	17.07
Resilience Disasters	221	56	25.34	31	14.03
Resilience Agriculture	73	25	34.25	15	20.55
Resilience Food Security	57	27	47.37	18	31.58
Resilience Conflict	99	20	20.20	13	13.13
Resilience Urban	237	68	28.69	41	17.30
Resilience Water	172	36	20.93	21	19.19
Resilience Economic	272	51	18.75	33	12.13
Resilience Infrastructure	125	21	16.80	11	8.80
TOTAL	1672	407	24.34	254	15.19

¹ All statistics are calculated based on by keywords and databases so that one paper can appear in two databases or for several keywords. Without the duplicates, the sample after the second scan numbered 165 papers (89 papers were duplicates).

Table 3: Search engine results from the first and second steps of the scan

Database	Results	Step 1	Ratio of papers retained	Step 2	Ratio of papers retained
Google Scholar (1)	536	154	16.10	105	19.59
Web of Science(2)	621	100	29.71	62	9.98
Ingenta Connect (3)	515	153	24.34	87	16.89
TOTAL	1672	407	24.34	254	15.19

Step 3: Focusing on high quality papers

To further refine the sample of the scan, only papers in journals with the highest impact were chosen. Therefore, all papers were ranked on the basis of their publication impact factor.² For each keyword category, we selected the top 50% of the highest ranking journal publications.

This step led to the selection of 69 papers. After detailed scanning, six papers were deleted. One was focused on a developed country, but this information did not appear in the abstract, which led to it being retained in the scan during the first step of the selection process. Two papers were not accessible with various subscription codes (they were published in *Transforming Government: People, Process and Police and Reviews in Aquaculture*). Finally two reports and one editorial have been also excluded.

The final sample in this review is therefore composed of 63 papers.

Table 4: Paper selection on the basis of publication ranking

Themes	No. of paper in a journal with impact factor	50%	Min impact factor in the category	Max impact factor in the category	No. of papers selected ³	Min impact factor in the selection	Max impact factor in the selection
Resilience Climate	47	23.5	0.15	6.3	27	1.03	6.3
Resilience Disasters	20	10	0.15	6	10	0.75	6
Resilience Agriculture	8	4	0.39	6	4	1.97	6
Resilience Food S.	10	5	0.14	6.31	5	2.26	6.31
Resilience Conflict	5	2.5	0.61	2.33	5	0.61	2.33
Resilience Urban	30	15	0	6	15	1.61	6
Resilience Water	16	8	0.15	3.31	8	1.45	3.31
Resilience Economic	23	11.5	0.33	6.3	14	1.48	6.3
Resilience Infra	10	5	0.33	6	5	1.70	6

2 The impact factor considered is the one available on the journal website and can be calculated for the last year or as an average over the last 5 years. As both statistics are not available for all journals, we selected the impact factor calculated for the last year, if available, and over the last 5 years if not.

3 If the limit of the 50% consider several papers with the same publication impact factor, we include all of them (e.g. if the impact factor at the 50% point was 2, but the following 6 papers were also 2, then these were also included).



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