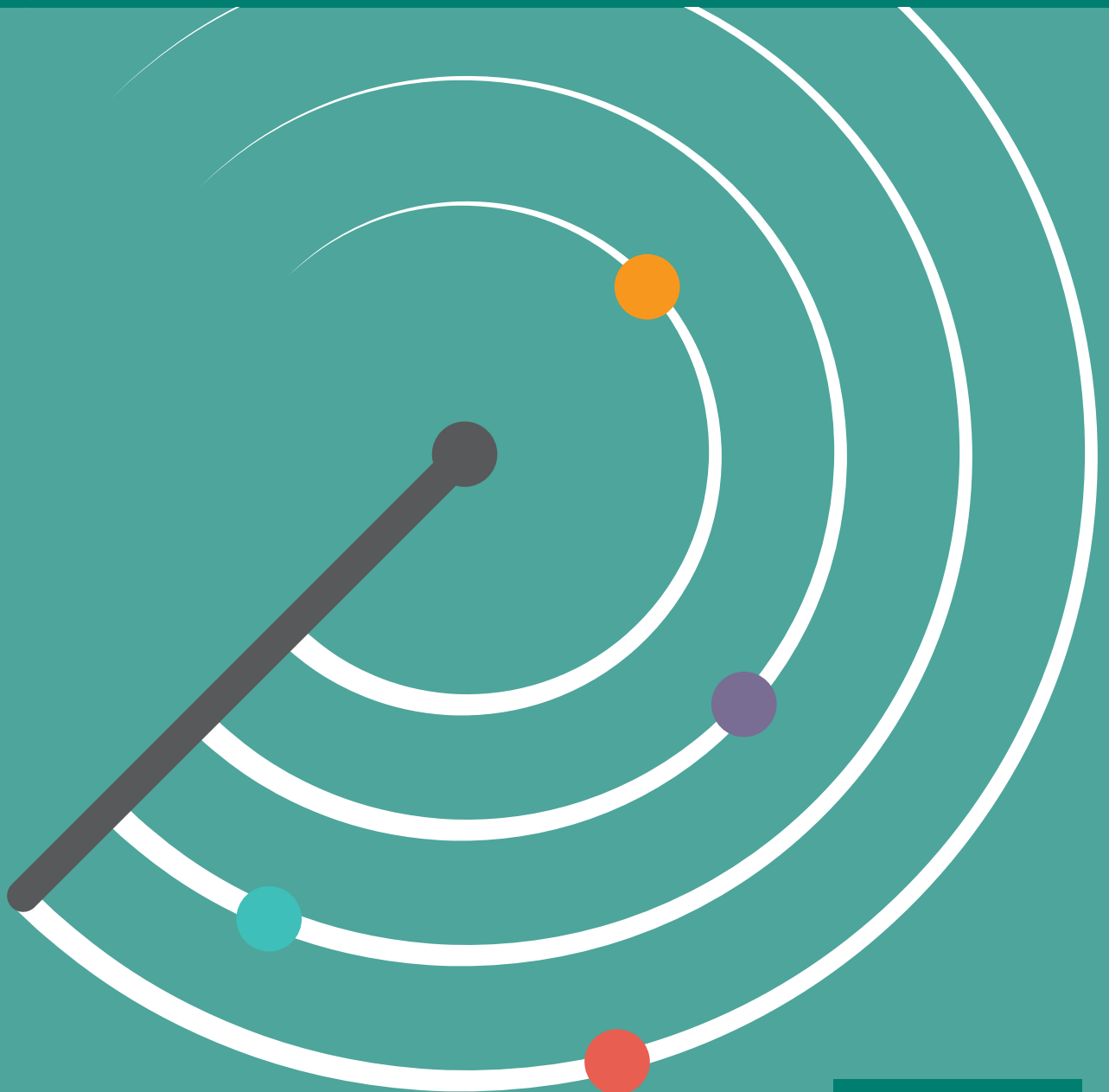




Resilience Scan | October-December 2016

A review of literature, debates and blogs on resilience

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REPORT

As the 'resilience revolution' in international development continues, researchers at ODI are capturing the new directions and reviewing the latest thinking in this field through The Rockefeller Foundation-supported Resilience Scan initiative. With a focus on developing countries, we present quarterly analytical reviews of resilience literature, social media activity and key resilience-related events, as well as collating the views of diverse resilience experts. Complementing these wide-ranging quarterly reviews are a number of 'deep-dive' analytical papers on key emerging resilience-related topics.

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Acronyms

AAT	absorptive capacity, adaptability and transformability	LDC	Least Developed Countries
APST	adaptation planning support toolbox	M&E	monitoring and evaluation
BRACED	Building Resilience and Adaptation to Climate Extremes and Disasters	MSMEs	micro, small and medium enterprises
CCA	climate change adaptation	NGO	non-governmental organisation
CCAF	Climate Change Adaptation Facility	OECD	Organisation for Economic Co-operation and Development
CSA	climate-smart agriculture	PREGEC	Regional System for Food Crisis Prevention and Management
DRM	disaster risk management	PREP	Partnership for Resilience and Preparedness
DRR	disaster risk reduction	RABIT	Resilience Assessment Benchmark and Impact Toolkit
FSA	food security and agriculture	SDG	Sustainable Development Goal
FSN	food security and nutrition	SIDS	Small Island Developing State
ICT	Information and communication technology	UN	United Nations
INGO	international non-governmental organisation	UNDP	United Nations Development Programme

Executive summary

Challenges for the future resilience agenda

Approaches to building resilience are still evolving, and lessons are emerging globally. The introductory section to this quarter's Resilience Scan summarises some of the emerging challenges for resilience practice based on a review of recent academic literature. Key areas for the future agenda include the role of resilience as an integrating concept, measurement challenges, issues of dependency and agency, social values and transformation, and critiques of resilience as an emerging narrative for international development.

Resilience in the blogosphere

This Scan provides an analysis of the 25 most shared blogs on resilience during the half year July to December 2016. While urban, agriculture and water issues continue to dominate resilience discussions, common themes in blogs reviewed here included the role of social processes and the role of (big) data in tracking and supporting resilience.

Resilience in the grey literature

This examination of the material on resilience published in 2016 Q4 in the grey literature includes 37 publications from research and private sector institutions, donors, and humanitarian and multilateral agencies. These span seven broad themes. Compared with the previous quarter's Resilience Scan, there has been an increase in the numbers

Table 1. Blog rankings – top ten (full list p. 17)

Rank	Blog post title	URL	Author
1	Nature: a better, faster, cost-effective answer for climate resilience?	www.triplepundit.com/2016/07/nature-a-better-faster-cost-effective-answer-for-climate-resilience	Lynn Scatlett
2	How language can enhance the resilience of Syrian refugees and host communities	http://blogs.worldbank.org/arabvoices/how-language-can-enhance-resilience-syrian-refugees	Joel Bubbers
3	5 bold initiatives in flood resilience	www.devex.com/news/5-bold-initiatives-in-flood-resilience-89036	Bill Hinchberger
4	Investing to make our cities more resilient to disasters and climate change	http://blogs.worldbank.org/sustainablecities/investing-make-our-cities-more-resilient-disasters-and-climate-change	Joe Leitmann and Valerie-Joy Santos
5	On the road to resilience: Reducing disaster and climate risk in Africa	http://blogs.worldbank.org/africacan/on-the-road-to-resilience-reducing-disaster-and-climate-risk-in-africa	Ede Ijjasz-Vasquez and Christoph Pusch
6	Climate change resilience may mean planting more trees	www.nationalgeographic.com/people-and-culture/food/the-plate/2016/october/in-kenya--the-answer-to-climate-change-may-be-in-the-trees/	Tim McDonnell
7	Want to survive climate change? You'll need a good community	www.wired.com/2016/10/klinenberg-transforming-communities-to-survive-climate-change	Eric Klinenberg
8	What is resilience and why does it matter now more than ever?	www.100resilientcities.org/blog/entry/what-is-resilience-and-why-does-it-matter-now-more-than-ever	Micheal Berkowitz
9	How tactical urbanism is creating communities of resilience experts	www.100resilientcities.org/blog/entry/how-tactical-urbanism-is-creating-communities-of-resilience-experts	Christine Morris and Katerina Oskarsson
10	How to develop a resilience strategy	www.100resilientcities.org/blog/entry/how-to-develop-a-resilience-strategy	Bryna Lipper

of publications considering Agenda 2030 and a decrease in those discussing migration.

Grey literature on *financing and measuring resilience* suggests:

- when given autonomy, communities tend to focus on building resilience to immediate threats rather than building adaptive long-term capacity
- insurers are uniquely positioned to build resilience due to their combination of underwriting and asset management activities, their access to extensive data and their engagement in multiple spheres of economic activity
- the need for analysis of the overall context in which people live, as well as the development of a critical awareness of people's own social reality
- the importance of strong partnerships built on mutual understanding, trust, respect, transparency and equity.

Grey literature on *urban and infrastructure resilience* suggests:

- leveraging private finance for urban resilience is possible through strategic expansion of co-financing, lending, guarantees and other risk-management instruments
- green infrastructure must be the foundation for town planning and development
- risk governance is an effective decision-making framework to help address urban resilience
- urban development plans, governance systems and budgets must adequately account for the specific needs of children.

Grey literature on *food security and agriculture (FSA)* suggests:

- flexible governance systems are crucial for delivering transformation towards climate-resilient food systems
- the need for low-cost and low-carbon technologies that lead to increased resilience and food security
- fertiliser subsidies and access to credit can promote specialisation rather than income and crop diversification
- the need to work with individuals and groups to increase coordination between communities of practice working on gender, resilience and climate change adaptation (CCA).

Grey literature on *social inclusion and social protection* suggests:

- social protection programmes need to consider the implications of climate risk in the design phase
- humanitarian actors, the private sector and donors need to support more equal roles for women through longer-term support for their businesses and livelihoods

- the need to explicitly target investments towards the poorest and most excluded.

Grey literature on *Agenda 2030 for Sustainable Development* suggests:

- coherence and cooperation across the frameworks and sectors is key to building resilience comprehensively and efficiently
- migration and climate resilience are both considered independently in the Sustainable Development Goals (SDGs), but without explicit connections
- the need to advance child-centred disaster risk reduction (DRR and CCA in Agenda 2030 through targets and pledges
- genetic diversity preserved by indigenous knowledge and practice provides a valuable resource for improving food security and adapting to climate change.

Grey literature on *climate change and disasters* suggests:

- disasters affect well-being more than traditional estimates of economic loss suggest
- international non-governmental organisations (INGOs) and non-governmental organisations (NGOs) require flexible funding and adaptive programming to innovate, protect development gains and respond to the most pressing needs during a crisis
- climate change can provide opportunities for small and medium-sized enterprises through the exploitation of new climate-resilient products
- accessing water and collecting fuelwood, in particular, have become increasingly time-consuming in the context of climate change, and adaptation initiatives therefore need to minimise these activities in order to address rural women's time poverty.

Grey literature on *governance for resilience* suggests:

- previous NGO presence can benefit resilience-implementing activities and the depth/breadth of changes by providing pre-existing data and supporting structures
- the need for greater integration between national scientific institutions producing climate services and local informal institutions better placed to disseminate information
- the importance of social groups and, increasingly, NGOs and the private sector in delivering financial services
- the need for governance systems to provide sufficient economic and social capital as well as the flexibility to allow innovation to emerge and gain strength.

Resilience in the academic literature

The review in this quarter includes 32 peer-reviewed journal articles on resilience published between October and December 2016. Six dominant themes emerged from the review process.

Academic literature on *community resilience and cooperation* suggests:

- participatory community-based approaches can help to integrate different types of knowledge within resilience initiatives
- internationally led development and conservation efforts are often unsuccessful because they do not sufficiently understand local context, disregard local knowledge and lack engagement with local communities
- community-driven efforts for urban poverty reduction and development can create co-benefits for climate resilience by decreasing exposure and reducing the underlying physical, economic and social drivers of vulnerability
- shared assets and resources support the long-term coping capacity of a community, given that these community capitals are invested in collective well-being.
- collaboration among small-scale fisheries in customary tenure systems supports their resilience in the face of ecological, social and economic shocks.

Academic literature on *policy, planning and governance for building resilience* suggests:

- information and communication technology (ICT) data can complement standard measures for early warning and disaster impacts in a cost- and time-effective way
- resilience planning tools can stimulate learning and support informed decision-making, while they are limited by the differences in contexts and types of hazards between locations and by viewing resilience as a co-benefit rather than a primary target in urban planning
- policies that understand forests as stable and optimisable entities for resource production increase the vulnerability of social-ecological systems, because they neglect the close interconnections between policy and dynamic forest systems
- rights-based approaches for fisheries appear to support resilience building better than open access arrangements.

Academic literature on *concepts, indicators and measurements* suggests:

- the specific context of an intervention should determine the monitoring and evaluation (M&E) approach used to study climate resilience planning



Rapid urbanisation in Vietnam, Ho Chi Minh City. Photo credit: Tran Viet Duc/World Bank. CC BY-ND 2.0.

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- recent advances in the measurement of development resilience can enhance the definition and measurement of food security
 - challenges related to limited data availability, expensive tools and the need for sophisticated software and technical skills can constrain effective monitoring of resilience and recovery.

Academic literature on *power and politics of resilience* suggests:

- social power structures and the relationships between local and national political systems can result in unequal access to support and to the processes of disaster recovery
- the need for a ‘decolonial turn’ in resilience thinking to explicitly highlight the role of power and settler colonialism in understanding resilience to disasters
- in addition to strengthening resilience, climate-smart agriculture (CSA) can empower women when emphasis is placed on training and leadership
- resilience frameworks need to consider the interactions between natural disasters, history and post-colonial racialised politics to understand marginalisation and injustices, and to create a more comprehensive form of resilience.

Academic literature on *urban resilience and infrastructure* suggests:

- social inequalities and marginalisation need to be overcome to strengthen the resilience of vulnerable urban populations
- post-disaster reconstruction can represent an opportunity to ‘build back better’ and make cities more resilient
- resilience in the form of bouncing back to the original state is not always desirable; breaking the ‘resilience’ of undesirable urban systems in the first place may be necessary to advance the agenda of sustainability, avoiding a return to the initial (unsustainable) state.

Academic literature on *agriculture and rural livelihoods* suggests:

- low-cost local interventions such as sand dams can be an effective tool to support management and contribute to building resilience in drylands
- flexibility, adapting practices and diversification are key strategies that small-scale farmers and pastoralists use to strengthen the resilience of their livelihoods
- shifting towards drought-resistant crops and livestock helps farmers and pastoralists to grapple with changing climate conditions.

1. Key challenges for the resilience agenda

Resilience thinking has a long history, but has emerged in the last decade to become a more widely adopted concept underpinning policies and projects. Approaches to building resilience are still evolving, and lessons are emerging globally. This introductory section to this quarter's Resilience Scan summarises some of the emerging challenges for resilience thinking and practice based on a review of recent academic literature. While resilience is being deployed in a wide range of contexts, this summary pays particular attention to climate-related shocks and stresses in the context of international development.

This section summarises some of the challenge areas for resilience practice centred on: resilience as an integrating concept, measurement challenges, issues of dependency and agency, social values and transformation, before finally discussing challenges for resilience as an emerging narrative for international development.

1.1. An integrating concept or conceptually vague?

A key element of the appeal of resilience lies in its ability to link action across sectors, systems and scales (Lovell et al., 2016). Examining case studies of food security and nutrition (FSN) programmes from the Horn of Africa and Sahel regions, Béné et al. (2016) find that the main value is the integrative nature of resilience; it is a 'mobilising metaphor', enabling multidisciplinary collaboration between groups and communities of practice that frequently work in silos. International development agencies, in particular, have used resilience as the basis for linking actions on climate change adaptation (CCA), disaster risk reduction (DRR), humanitarian response, peace-building and food security programming (Davies et al., 2013; Weichselgartner and Kelman, 2015).

The use of resilience as a common language and integrative 'boundary object' (Brand and Jax, 2007) has fuelled creativity, joint problem solving and articulation around shared goals (Strunz, 2012). Such common language and goal setting is evident in the post-2015 agreements: the Sendai Framework for Disaster Risk Reduction, the United Nations Sustainable Development Goals (SDGs), the Paris Agreement on Climate Change

Approaches to building resilience are still evolving, and lessons are emerging globally

and the World Humanitarian Summit framework. **The resilience concept features in all four of these major multilateral frameworks and agreements** (Peters and Tanner, 2016). Each articulates the importance of resilience in achieving global change across a wide variety of sectors, contexts and scales, drawing together disparate or poorly connected actors.

The issue of multiple definition is not a new one, but the multiple disciplinary roots of resilience concepts also contribute to the diversity of interpretations (Figure 1; see also Gallopin, 2006; Rose, 2007; Davoudi, 2012; Reghezza-Zitt et al., 2012; Alexander, 2013; Olsson et al., 2015; Patel et al., 2017). There is significant variation in how tightly the term resilience is defined. Béné et al. (2017) show how the definition of urban resilience varies from being very specific, to having a looser general meaning, to cases where the term may not be defined at all.

The term resilience also varies in intent, being used as a goal, a tool, a metaphor and a buzzword (Béné et al., 2017: Table 1). While the flexibility over the use of the term as a 'boundary concept' can potentially be beneficial in bringing together disparate groups, institutions and disciplines, some commentators have warned that its use

Table 2. Uses of the resilience concept

Resilience as	Purpose
Goal	To determine what to aim at
Analytical tool	To understand the problem and find better solutions
Metaphor	To help break disciplinary or sectoral silos
Indicator	As a part of development objectives and sustainability
Buzzword	As a strategy (e.g. to publish or attract funds)
No use	Used in name only

Source: adapted from Béné et al. (2017).

as a buzzword can lead to ‘paradigm creep’: the use of buzzwords far beyond their original sphere of application, which in turn can dilute meaning and utility (Brand and Jax, 2007; Park, 2011).

The flexibility that permits integration can also constitute a weakness. For instance, in international policy such as the United Nations (UN) post-2015 frameworks, there is inconsistency in defining and measuring resilience, making it hard for joined-up actions at the national or subnational level (Matyas and Pelling, 2015; Peters and Tanner, 2016). Delivering resilience outcomes across disciplinary and organisational boundaries remains a key challenge. In academia, a network analysis of research articles suggests that resilience has largely been discussed within individual disciplinary silos rather than across them (Baggio et al., 2015). Some have argued that this may be because many of the core resilience concepts drawn from the ecological systems are not necessarily transferable or compatible with those from the social sciences (Alexander, 2013; Cannon and Mueller-Mann, 2010). These different disciplinary ways of understanding the world are also present in different sectors, frustrating the ability to work on resilience holistically across organisations and institutions.

One important distinction is that between more static and dynamic interpretations of resilience (Davoudi, 2012). The former generally frame resilience in terms of bouncing back to normality, drawing especially on engineering concepts (Holling, 1996). In contrast, more dynamic resilience thinking draws heavily on concepts

from social-ecological systems, which emphasise non-linear change, the inevitability of uncertainty and surprise, and interrelationships and dynamism of multiple cross-scale systems (Folke, 2006).

Some operational frameworks draw on the dynamic characteristics of resilient systems (Constas et al., 2014; da Silva and Morera, 2015), explicitly embracing uncertainty and change. However, in their review, Reghezza-Zitt et al. (2012: para 6) conclude that, despite the growth of dynamic resilience thinking, ‘most of the time, there is recovery, reconstruction, renewal, a return to equilibrium, to normality, etc., all situations that can be linked to the concept of resilience that, etymologically, refers to the idea of rebound’.

1.2. Measuring resilience

While the integrative function of resilience is important, resilience can also help us to understand the processes that constrain and enhance human development. This analytical function requires conceptual clarity. Where the definition of resilience is ambiguous, then naturally measurement becomes contested and a major challenge. The choice of resilience indicators will, to some extent, depend on the system, subsystem or target group that is of interest.

While they are highly varied, approaches to resilience measurement can be loosely categorised into those focusing on:

Figure 1. The multidisciplinary aspect of resilience



Source: adapted from Reghezza-Zitt et al. (2012).

- **assets:** avoided-loss approaches that assess actual or potential losses to assets or resource flows as a result of shocks and stresses
- **activities:** climate proofing and inputs-based approaches that diagnose the need for, and track the development of, resilience-building activities
- **performance:** approaches that define, assess and track the characteristics and capacities that enable resilience of different systems.

One challenge emerges clearly from the **interrelationships between many different parts of the system**. Infrequent, but higher-magnitude, shocks will interact with recurrent stressors, such as waterlogging, that tend to be lower profile but may be a critical threat to resilient livelihoods (Bozza et al., 2015). At the same time as assessing this mixed and dynamic hazard burden, resilience will relate to other changes in the system, including changes to the assets exposed (e.g. building more houses on the floodplain) or sensitivity of activities pursued (e.g. a move to more rain-dependent farming). Therefore, measuring resilience requires integrated approaches that can capture the interactions within and across systems as they respond to multiple, dynamic and uncertain risks. This requires consistent definition and tracking, which is complicated in areas of rapid population flux and informality, such as urban areas of the developing world.

Dynamic resilience approaches call for measurement approaches that go beyond individual assets, or change in hazard burden due to climate change, in order to capture how actions improve or erode the resilience of the wider system by affecting the flexibility required to handle surprise and multiple interacting impacts. This systems approach adds significant complexity to more linear measurement approaches. More comprehensive approaches also need to measure indicators across categories (Béné et al., 2015: 9). These categories include:

- an **ex ante component:** resilience capacity, initial well-being outcomes and initial vulnerability level
- a **disturbance component:** natural disasters, pest/disease outbreaks, political conflicts and economic shocks/stressors
- an **ex post component:** resilience capacity, well-being outcomes and vulnerability level.

Attribution and lifespans also complicate the measurement of resilience. Infrastructural, environmental, economic and social elements of a system all interact mutually through a dynamic network of relationships (Bettencourt et al., 2010; Bozza et al., 2015). However, in

Measuring resilience requires integrated approaches that can capture the interactions within and across systems as they respond to multiple, dynamic and uncertain risks

general, it can be easier to attribute the contribution of a specific piece of infrastructure to a city's resilience than that of an aspect of the social system. Infrastructure also tends to change less over time than social or economic systems, although it is important to be aware that infrastructure resilience can still change, especially due to physical decay.

This highlights a challenge common to much measurement that can bias action towards more easily measured and quantified elements. Weichselgartner and Kelman (2015) find that international recommendations for resilience building are often based on unchallenged assumptions about the social world and are heavily reliant on quantitative data. As such, they **fail to recognise the importance of qualitative data and the process-oriented factors that cannot be captured through quantitative data alone, such as power, governance and social capital**. Sudmeier and Jaboyedoff (2013) highlight the limitations of relying on outcome indicators for case studies of community flood resilience in Nepal. The paper sets out the need to measure and validate the role of resilience-building processes (such as grazing management practices, skills training, organisational skills and education) in determining these outcomes.

There is also growing acceptance that resilience should be measured not only by means of statistically or conceptually generated indicators, but also by the values identified by citizens themselves as to what makes them resilient (Maxwell et al., 2016; Jones and Tanner, 2017). **Assessing such 'subjective resilience' can also help to enhance stakeholder engagement and joint ownership of the resilience values that an intervention is seeking to realise.**

Finally, as highlighted in the next section, business cases for investing in resilience commonly rely on demonstrating the avoided losses from potential disturbances. A lack of historic data on hazards, exposure, sensitivity and damages can hamper loss assessments and modelling. However, these business cases are also reliant on crises or disaster events happening during the monitoring period to demonstrate their worth. Modelling of risk can help by assessing potential future loss, but are costly and data reliant (Mitchell et al., 2014).

1.3. Resilience-building interventions, dependency and agency

Many efforts to promote dynamic resilience approaches to date have been supported by organisations external to the system in question. Organisations such as The Rockefeller Foundation and international development agencies have drawn on resilience approaches to frame their work on risk management and crisis response. Such interventions almost always aim to generate sustainable outcomes so that external support can be tapered down to leave an autonomously functioning process. However, despite the growing attention to ‘exit strategies’ to ensure sustainability, academic articles have argued that intervention can lead to dependence (Lewis, 2013) and the erosion of cultural or societal processes, and therefore actually reduce resilience capacities (Gaillard, 2007). Others have argued that the imperative should be for intervention to support the more autonomous processes that drive resilience in sub-systems such as urban neighbourhoods (Moench et al., 2015). O’Hare and White (2013) suggest that resilience is less appropriate as a meta-narrative for development and more appropriate when considered as a consequence of numerous small solutions that often build on existing social responses.

The challenge for resilience-building practice has therefore been to explicitly connect with local-level processes. For some theorists, the resilience narrative provides an opportunity precisely to re-engage with ‘the local’ and engage with the highly contextual nature of vulnerability (Kelman, 2008). The resilience approach thereby places the emphasis on the self-empowerment of local actors, not on the imposition of solutions developed externally to the local contexts in which they are applied (Chandler, 2014).

1.4. Injecting social values: people, politics and equity

A key challenge for resilience as a framing development goal is that the concept of resilience is not inherently invested with a direction or goal, and can easily be employed without reference to its subjects (Swanstrom, 2008). Some have linked this neutrality with the challenges of translating a concept born from social-ecological systems thinking and a value-free natural science epistemology (Leach, 2008; Friend and Moench, 2015), although it is notable that that the development of social-ecological systems thinking from ecosystem management was explicitly value-laden in trying to preserve ecosystem service flows.

A key critique, therefore, argues that resilience stresses the scientific, the technical and the rational while paying inadequate attention to the human and social. This risks excluding individuals from an active role in building

(and weakening) resilience, and an incorporation of their aims and values. Underemphasising ‘people’ in resilience thinking also results in blindness to the inherent political complexity in issues of managing risk (Kuhlicke, 2010). Limited attention is then paid to the structures and forces that shape these challenges. As Swanstrom (2008: 18) notes: ‘Resilience tends to treat stressors as generated by basically unpredictable forces in nature, such as storms, climate change, or forest fires. A forest cannot prevent fires or stop climate change. Humans can.’

Some commentators have argued that resilience represents a framing for development that has the potential to depoliticise problems. By defining goals in terms of the resilience of a system, we can therefore shift the focus away from the root causes and unequal power relations that were an inherent part of the previously dominant discourse around vulnerability (Gaillard, 2007; Cannon and Müller-Mann, 2010). This has led to calls for more explicit recognition of the way that politics and power relations mediate resilience processes and outcomes (Swanstrom, 2008; Bahadur and Tanner, 2014).

Resilience is contingent on social values relating to what we deem important and how we ought to allocate resources to foster it (O’Brien and Wolf, 2010). The uncritical assumption of positive outcomes from resilience building may fail to address different winners and losers, and the political processes mediating trade-offs between actors. Indeed, people may be perpetually locked into resilient but undesirable states of poverty and marginality (Tanner et al., 2015). Newton (2016) illustrates such trade-offs in European forests, where resilience is being used as a justification to promote management interventions that enhance resilience, but also negatively affect biodiversity.

Injecting explicit values necessary for resilience approaches provides both a successful and an equitable basis for improving development outcomes. Resilience thinking, therefore, needs to focus on the ways that different groups of actors construct ideas of ‘resilience’ in order to pursue their interests (Smith and Sterling, 2010). This provides an important means of enhancing the place that ‘people’ have within the concept of resilience. In practice, many approaches to resilience are explicit in defining their goals and targets. But, in many cases there is a need to ‘reflect on what precisely it is that is being made resilient, in the face of which specific dynamics, for whom and by what criteria this is good or bad, and whether such resilience is consequently problematic or not’ (Smith and Sterling, 2010: 10).

1.5. Bouncing back? Resilience and transformation

Injecting resilience thinking with explicit and transparent values is especially important given that the interpretations and definitions of resilience have varied widely across disciplinary, sectoral and geographical contexts. A critical challenge for resilience building lies in the distinction between resilience interpreted as ‘bouncing back’ to an original state and resilience as ‘bouncing forward’ or transforming those systems to anticipate and adapt to future changes. Analysis of policy discourses of resilience in the field of climate change and development suggests that resilience practice has overwhelmingly supported the status quo and promotion of ‘business as usual’ (Brown, 2012).

This ‘bounce back’ interpretation has prompted some questioning of resilience as a development narrative, given that returning to the normal state means returning to the conditions that caused the disaster or crisis. Kelman et al. (2015) suggest that the original conditions may be a state where women are oppressed, racial segregation is rife and poverty is endemic. Such ‘normality’ may not be in line with development objectives. Similarly, White and O’Hare (2014) question the use of resilience in planning contexts as a techno-managerial approach that maintains existing institutional structures. As a result of these challenges, there is increasing interest in how systems can be transformed to better anticipate, absorb and adapt to future disturbances (Bahadur et al., 2015).

Chelleri et al. (2015) examine the potential of Mexico City’s urban regeneration and development ‘Green Plan’ to move beyond resilience towards effecting transformation through decentralised water management and service delivery. The paper argues that, while the plan adequately provides adaptation actions necessary to support resilience, it fails to adequately address the political barriers (community engagement, education and empowerment) that will ensure transformation through decentralisation. This is a conceptual as much as a practical challenge, given that urban resilience often remains a conservative concept for planning deployed to tackle specific vulnerabilities.

1.6. Resilience as neoliberal narrative

One emerging set of challenges centres on critiquing the use of resilience as a concept set within wider discourses of neoliberal economics and governance. These commonly present resilience as a form of ‘governmentality’ (control through governance). In this reading, resilience is used as a means of exerting control, or appearing to exert control, over complex challenges (O’Hare and White, 2013). The resilience discourse is constantly sustained and legitimised by subjecting individuals to conditions of unpredictability, novelty, vulnerability and transformation (Welsh, 2014). Resilience is then used as a way to depoliticise socioeconomic shocks and disturbances.

Some commentators have noted that resilience can be (mis)used as a narrative that enables governments to deprive subjects of their rights or to transfer responsibility from the authorities to local residents (Joseph, 2014; Welsh, 2014; Gillard, 2016). Rinne and Nygren (2015), for example, argue that framing the problem of urban flooding in Mexico in terms of resilience has facilitated the propagation of a view that battling floods is more about ‘self-responsibility’ and ‘self-governance’. Methmann and Oels (2015) argue that a focus on resilience helps absolve industrialised nations of their responsibility towards the vulnerable populations in the Global South as it frames issues in a way that makes populations affected by climate change responsible for securing themselves.

Others have engaged with similar issues but drawn different conclusions, stressing that the ‘self-organisation’ and ‘internal capacities’ emphasised in resilience are not negative traits that allow powerful actors to take no responsibility for the vulnerable. Instead, resilience emerges as a liberating and empowering concept, encouraging devolution of power and exercise of free will (Joseph, 2014). Indeed, Chandler (2014) argues that resilience is an alternative to supply-driven policy interventions that are out of touch with the highly contextual nature of vulnerability.

2. Resilience in the blogosphere: blogs most shared from July to December 2016

2.1. Methods

This section offers insights into how the concept of resilience is written about and discussed in the blogosphere by identifying and analysing the top 25 blog posts on resilience published in the second half of 2016. This illustrates the popular contexts in which resilience is blogged about, and key themes that dominate blog discourses of resilience. Here, blogs are defined as weblogs or blogsites (websites that publish blog entries), whereas blog posts are discrete, published (with date) blog entries or articles.

When it comes to data gathering and analysis, the discursive characteristics of blogs (comments, response posts, linking, etc.) require a different approach to that used for short-form social media such as Twitter. More manual (instead of software-based) search and analysis is required for blog posts. The basic approach here is based on the metrics of visibility and (online) impact and engagement, and comprises three phases:

1. Using blog search engines, Boolean search queries were performed to identify blog posts that publish about resilience in the context of key sectors/keywords (Resilience plus: Climate, Agriculture, Urban, Water, Disasters, Food Security and Conflict). This initial exploratory search identified the top 50 resilience blog posts.
2. To narrow down the list, it was reviewed manually to exclude blogs that:
 - have low keyword/subject matter relevance
 - are cross-linked ‘farms’ and blog aggregators, which do not publish original content, or syndicate posts from other blogs
 - have no measurable social sharing features.

3. The top 25 blog posts were ranked by social visibility (Table 3, ‘Social visibility score’), created by aggregating key social media metrics from:
 - Facebook likes and shares
 - LinkedIn shares
 - Twitter tweets
 - backlinks (external hyperlinks from one web page/site to another, often used in measuring blog post impact and readership).

2.2. Trends in resilience

Blog 21 (Table 3) addresses general trends in resilience built on lessons from the 2016 Adaptation Futures conference in Rotterdam. These include:

- **A focus on the individual** rather than the aggregate scale. For example, the city of Rio de Janeiro’s resilience team will be measuring individuals’ perception of risk, their level of preparedness and their knowledge of risk-reducing habits.
- **A focus on cities** at the forefront of both climate impacts and climate action. New York, London, Durban and others have established climate task forces and partnerships.
- Nature-based solutions are gaining ground (see section 2.6), including ‘green’ infrastructure such as forests, and restored landscapes for water services – and trees, grasses and green roofs for heat stress and flooding.
- **Adaptation** will transform development models to meet greater goals of food security, continued prosperity or livelihood security.

Table 3. Top ranking resilience blog posts in the second half of 2016

Rank	Blog post title	URL	Author	Social visibility score ⁱ
1	Nature: a better, faster, cost-effective answer for climate resilience?	www.triplepundit.com/2016/07/nature-a-better-faster-cost-effective-answer-for-climate-resilience	Lynn Scatlett	43,700
2	How language can enhance the resilience of Syrian refugees and host communities	http://blogs.worldbank.org/arabvoices/how-language-can-enhance-resilience-syrian-refugees	Joel Bubbers	30,100
3	5 bold initiatives in flood resilience	www.devex.com/news/5-bold-initiatives-in-flood-resilience-89036	Bill Hinchberger	17,000
4	Investing to make our cities more resilient to disasters and climate change	http://blogs.worldbank.org/sustainablecities/investing-make-our-cities-more-resilient-disasters-and-climate-change	Joe Leitmann and Valerie-Joy Santos	15,800
5	On the road to resilience: Reducing disaster and climate risk in Africa	http://blogs.worldbank.org/africacan/on-the-road-to-resilience-reducing-disaster-and-climate-risk-in-africa	Ede Ijasz-Vasquez and Christoph Pusch	14,900
6	Climate change resilience may mean planting more trees	www.nationalgeographic.com/people-and-culture/food/the-plate/2016/october/in-kenya--the-answer-to-climate-change-may-be-in-the-trees	Tim McDonnell	9,000
7	Want to survive climate change? You'll need a good community	www.wired.com/2016/10/klinenberg-transforming-communities-to-survive-climate-change	Eric Klinenberg	4,500
8	What is resilience and why does it matter now more than ever?	www.100resilientcities.org/blog/entry/what-is-resilience-and-why-does-it-matter-now-more-than-ever	Micheal Berkowitz	4,200
9	How tactical urbanism is creating communities of resilience experts	www.100resilientcities.org/blog/entry/how-tactical-urbanism-is-creating-communities-of-resilience-experts	Christine Morris and Katerina Oskarsson	4,100
10	How to develop a resilience strategy	www.100resilientcities.org/blog/entry/how-to-develop-a-resilience-strategy	Bryna Lipper	4,000
11	Planning for resilience: innovative land use policies for building a resilient city	www.100resilientcities.org/blog/entry/planning-for-resilience-innovative-land-use-policies-for-building-a-resilient-city	Amy Armstrong	4,000
12	Reporting from the front: architecture and design's role in building resilience	www.100resilientcities.org/blog/entry/reporting-from-the-front-architecture-and-designs-role-in-building-resilient	Siddharth Nadkarny	3,800
13	How community gardens are fighting for food justice in the rockaways	http://civileats.com/2016/08/03/how-community-gardens-are-fighting-for-food-justice-in-the-rockaways/	Lisa Held	1,600
14	Collaboration is key to sustainable climate resilience solutions	https://medium.com/@adamsmithinternational92/collaboration-is-key-to-sustainable-climate-resilience-solutions-37e386f2bbfb#.ew61ylq10	Adam Smith International	1,500
15	Water resilience that flows: open source technologies keep an eye on the water flow	https://phys.org/news/2016-07-resilience-source-technologies-eye.html	American Society of Agronomy	1,100
16	India, how indigenous farmers are developing climate-resilient agriculture	www.lifegate.com/people/news/india-indigenous-communities-climate-resilient-agriculture	Basudev Mahapatra	773
17	Honey with coffee reinforces climate resilience	http://indiadialogue.net/2016/09/14/honey-coffee-reinforces-climate-resilience	S. Gopikrishna Warrier	710
18	Carbon key to building resilience on farms	www.manitacooperator.ca/crops/soil-carbon-key-to-building-resilience-on-farms-says-organic-scientist	Laura Rance	602
19	How USAID and the military are building resilience in the Asia-Pacific	https://blog.usaid.gov/2016/09/how-usaid-and-the-military-are-building-resilience-in-the-asia-pacific	Kristen Byrne	475
20	Data-driven, climate-resilient flood management	https://undp-adaptation.exposure.co/datadriven-climate-resilient-flood-management	Climate Adaptation UNDP	405
21	5 emerging trends in climate resilience	www.greenbiz.com/article/5-emerging-trends-climate-resilience	Katerina Elias and Ayesha Dinshaw	383
22	Three steps to solving water scarcity and creating climate resilience	www.iwa-network.org/three-steps-to-solving-water-scarcity-and-creating-climate-resilience	Ger Bergkamp	357
23	White House, Google, Amazon, launch big data tool to help companies' climate resilience planning	www.environmentalleader.com/2016/09/white-house-google-amazon-launch-big-data-tool-to-help-companies-climate-resilience-planning	Jessica Lyons Hardcastle	189
24	UN Global Pulse, BBVA announce partnership project measuring economic resilience to disasters with financial data	http://unglobalpulse.org/news/GP-BBVA-partnership-and-project-measuring-economic-resilience-with-financial-data	UN Global Pulse	180
25	The promise of freshwater resilience	www.rockefellerfoundation.org/blog/promise-freshwater-resilience	Anna Brown, Fred Boltz	125

i Aggregate of key social media metrics from: Facebook likes and shares; LinkedIn shares; Twitter tweets; and backlinks.

- **Finance** needs to reach local levels faster, particularly in developing countries at the front line of climate impacts. Identifying actions that tackle both emissions mitigation at the same time as adaptation will strengthen incentives and maximise contribution to the SDGs.

Michael Berkowitz reflects in **blog 8** on major trends in urban resilience based on the 100 Resilient Cities initiative. He notes that:

- **Resilience is ‘entering the bloodstream’ of cities.** This is illustrated by Thessaloniki in Greece, where the opposition party has appointed the world’s first Shadow Deputy Mayor for Resilience, demonstrating that the agenda has become a significant cross-party priority.
- **Resilience is increasingly front-of-mind in the private sector.** Resilience provides business opportunities, such as new partnerships to provide analysis and diagnose actions on resilience to urban heat effects in Los Angeles. Businesses are increasingly acting to embrace the resilience of their own operations.
- **Resilience is about collaboration,** with all levels of government, the private sector and civil society working cooperatively towards a common purpose of reducing catastrophic risk and improving the daily lives of residents.

Blog 5, by Ede Ijjasz-Vasquez and Christoph Pusch, summarises the World Bank Africa Disaster Risk Management Strategic Framework 2016–2020, designed to help African countries better manage natural disasters such as droughts, floods, landslides and storms. It introduces the three main pillars of action: **partnerships, knowledge**

(including country risk profiles and building institutional capacity) and **investments** (mainstreamed disaster and climate resilience comprise more than 10% of the World Bank’s Africa portfolio).

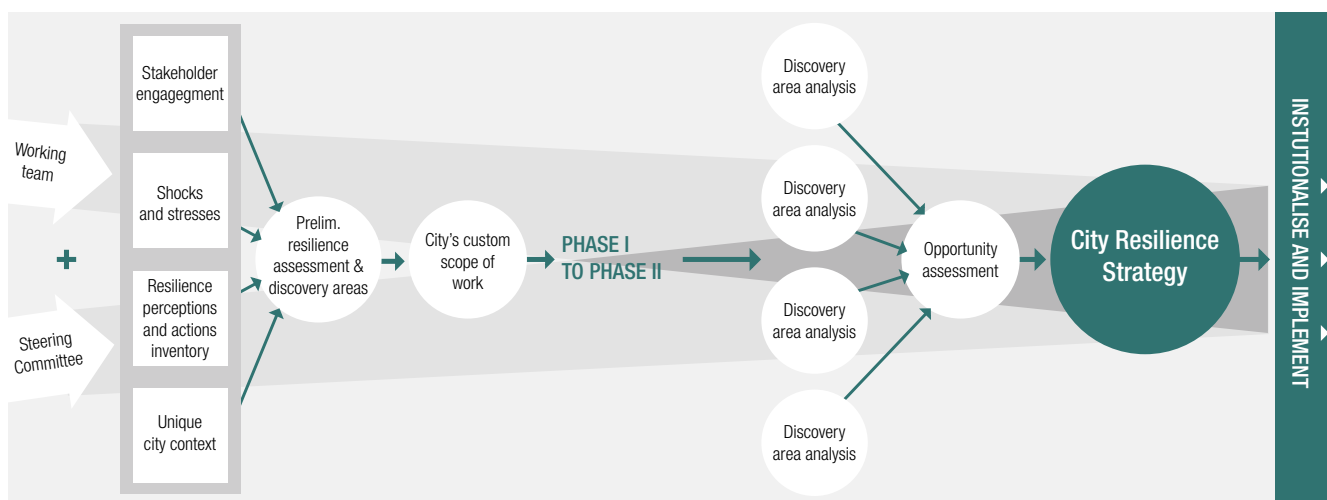
2.3. Urban resilience

In addition to blog 8 by Michael Berkowitz, three others focus on experiences from building urban resilience (see also further urban content in section 2.4). In **blog 10**, Bryna Lipper reflects on experiences creating **City Resilience Strategies**. This is an inclusive process of between six and nine months that brings people together to understand challenges and capacities (see Figure 2). The resulting document reflects the cities’ priorities for building resilience. The first phase gathers data, engages the community and stakeholders, seeks to understand how cities function and creates a preliminary work plan. Phase two turns these diagnostics and assessments into actionable initiatives before implementation.

Blog 4 outlines the critical window of opportunity to make cities and the urban poor more resilient. This will require **significant additional financing** for infrastructure (\$0.4 to \$1.1 trillion annually) to make infrastructure low-carbon and climate-resilient. The blog outlines areas in which the World Bank can help address constraints to investment:

- Assist subnational governments to increase their own-source revenue, improve fiscal management, enhance creditworthiness, improve capital investment planning and prepare investor-ready projects.

Figure 2. The City Resilience Strategy development process



Source: adapted from 100resilientcities.org

- Leverage the private capital required through a suite of existing instruments that identify risks, provide mitigation solutions and facilitate investment at household, community, city and national levels.
- Provide complementary services to support urban resilience, such as analytical tools and methods, frameworks for policy dialogue and reform, and procedures for working across sectors.

Blog 11 reflects on the experiences of the 100 Resilient Cities network in **applying land use tools to advance resilience goals**. They include designing and deploying land use to:

- realise multiple benefits and ‘resilience dividends’: Mexico City is building public space in concert with flood protection measures
- share risk and responsibility between all city stakeholders: this includes extending resilience building into the planning and policy of various sectors across the city, not keeping it the preserve of public authorities
- rethink scales of influence: resilience challenges often extend beyond jurisdictional borders, including through migration or regional watershed issues.

2.4. Social processes (in urban areas)

Five blogs in the review period highlight the need for greater emphasis on social processes in supporting urban resilience. **Blogs 7** and **12** highlight that attention to physical infrastructure in underpinning resilience is increasingly being challenged by examples of more socially informed understanding. **Blogs 13** and **9** provide examples of processes of community engagement that empower local residents to take action to strengthen their resilience and that of their neighbourhoods.

Joel Bubbers explains in **blog 2** how **improving language education for refugees** can enhance both their livelihood resilience and personal resilience. This includes foreign language training to improve opportunities for vocational training and meaningful employment. The training of English language teachers in Zaatari refugee camp in Jordan is used as an example. Research has also found that allowing children to express feelings of loss, fear and despair in a neutral language helps deal with pent-up emotions and develops resilience.

Siddharth Nadkarny (**blog 12**) highlights how the process and design of architecture contribute to social resilience and a sense of community. Examples from Ulan Batur and Germany show how attention to ‘Arrival City’ areas enables migrants to integrate into the city by creating a transitional boundary space. Good transport links connecting these neighbourhoods to outside areas

can promote integration, while participatory and inclusive processes can enhance the sense of community, ownership, integration or revival.

Eric Klinenberg (**blog 7**) reinforces this argument, noting that studies of urban crisis usually focus on hard infrastructure: electrical grids, transit networks, communications systems and water lines. While physical failures can help understand disturbances at the wider scale, **social processes explain the variations in impacts between communities**. For example, research following Superstorm Sandy found longer recovery times in neighbourhoods with low levels of social cohesion, as measured by how much people said they trusted their neighbours.

Lisa Held’s blog (**blog 13**) describes the establishment of a **youth-led community garden** in the Rockaways neighbourhood of New York. In an area of chronic food-related health problems, the garden helps young people learn that access to fresh, healthy food is their right, and is also in their own hands. **Blog 9** describes how Norfolk, Virginia, is creating communities of resilience ‘experts’ through workshops to help residents learn how they can develop **small-scale flood mitigation projects**, such as rain barrels, bioswales that remove silt from surface run-off, green roofs, planters and cisterns. In doing so, residents can make a significant difference by reducing the amount of water entering the storm water system.

2.5. Agriculture

In addition to the urban agriculture themes touched on in blogs on social processes, agriculture and food security emerged as a key theme in this Scan. Three blogs addressed the topic directly. Basudev Mahapatra in **blog 16** reports how tribal communities in Odisha state in India have responded to the challenges of deforestation and climate change by developing **innovative climate-resilient farming** to achieve food security and guarantee income while allowing the ecosystem to rejuvenate. Food shortages have led to widespread migration, especially by men, but women have started to take up climate-resilient agriculture practices, leading to enhanced productivity and income generation. Restructured family farms have combined subsistence crops, seasonal crops, income-generating fruit trees, and fodder and firewood plants. No tilling/no weeding practices and applying vegetative waste to the ground as mulch have reduced erosion and boosted soil fertility, while ending the use of inorganic fertilisers or chemical pesticides has brought down input costs.

The first step to feeding the world is for farmers to **start feeding the micro-organisms in their soil**, reports Laura Rance in **blog 18**. **Soil carbon, in the form of soil organic matter**, is a slow-release form of key nutrients,

including nitrogen, phosphorus and sulphur, that helps both plants and soil microbes to thrive. It can also hold more water and release it as needed, helping protect crops from dry conditions. The balance between carbon and available nitrogen can be improved by using different combinations of crops, rotations and by including perennial legumes in the mix.

Blog 17 of this Scan describes how coffee farmers of the Kodagu district in Karnataka, India, could add to their incomes through **payments for ecosystem services** that incentivise them to conserve the landscape they have inherited for the benefit of the wider community. The coffee plantations in this region support biodiversity, carbon sequestration and water regulation, so the idea is to extend eco-certification of coffee to landscape labelling that can benefit the district in its entirety, giving an incentive to the communities to plan their development sustainably.

2.6. Water

Water management and flooding continue to receive significant attention in blogs on resilience. In this Scan, five blogs deal with water issues in addition to two of the blogs grouped under the 'Data' theme in the following section.

In **blog 3**, Bill Hinchberger outlines bold and novel examples of flood resilience from around the world, with a common focus on planning and preparedness. These include the **African Risk Capacity Insurance Company Limited** that provides insurance to entire countries against the risk of drought (and is now working to create a flood-based model). The storm-prone **city of Catbalogan in the Philippines** is building a new city centre on land 120 metres above sea level, with household gardens, renewable power, and walking and cycling favoured over cars, as well as a new lagoon to protect the old city centre from flooding. **Dakar in Senegal is addressing drainage problems** by using natural waterways and gravity rather than pumps to ensure flows. In **Nepal** there is a project involving humanitarian organisations to introduce vouchers to buy locally produced goods and relief supplies from local farmers. This avoids relief inadvertently disrupting markets when free handouts are provided during a short-term crisis.

Resilience is discussed in terms of adaptation to climate change in **blog 14** by Zipozihle Chuma Nombewu. With climate projections suggesting longer and more frequent droughts in Southern Africa, she describes how improving water supply through small-scale infrastructure is helping Bikita and Chivi districts in Zimbabwe to strengthen resilience. The blog describes the Kufandada project, where the analysis identified the need for solar panels to replace less reliable hydro-power to provide power to the local hospital, which benefits around 15,000 people.

Blog 25 calls for a **rethinking of our stewardship of water to enable the resilience of both ecosystems**

and economies. The blog highlights progress in water management in the **Indian city of Indore**, involving an integrated and diversified system, with layers of redundancy for sourcing and storing water, in line with resilience thinking. A community-managed reverse osmosis plant to provide safe drinking water has already recouped the initial investment and the surplus of quality water is being sold to better-off residents nearby who appreciate its reliability.

In **blog 22**, Ger Bergkamp sets out **three steps to solving water scarcity and creating climate resilience.** These include: addressing water scarcity and drought through **demand management** rather than only through building large infrastructure for water supply; creating water markets that allow water users to **trade the right to use water** (such as in the Murray Darling Basin in Australia); and **new technologies** to help avoid drought and improve human health, such as desalination and water reuse technologies, decentralised water systems using rainwater harvesting, local water reuse and nanotechnology to purify groundwater.

Blog 19 provides examples of civilian–military cooperation on the ground through collaborations between the US Agency for International Development (USAID), the US Department of Defense and the United States Army Corps of Engineers. Examples include groundwater modelling training in Cambodia, and a \$40.5 million multipurpose cyclone shelter project to help up to 180,000 Bangladeshis prepare for future tropical cyclones.

2.7. Data

Four blogs in this Scan period reflect the growing attention to data for resilience. **Blog 15** reports on the testing of **low-cost river water data loggers** and open source sharing of the resulting data to help build resilience to water resource stress in Costa Rica. Similarly, **blog 20** examines how a network of **hydro-meteorological monitoring** can enhance resilience in Bosnia and Herzegovina's Vrbas River Basin following extensive flooding, landslides and damage in 2014. The network forms the basis for the river's flood forecasting and early warning systems, linked to response and preparedness measures, with coordination across different administrative jurisdictions.

Blog 24 outlines a project to use **financial transaction data** following a disaster event to help measure economic resilience. Findings showed that, at the household level, people spent 50% more than usual on items such as food and petrol in preparation for Hurricane Odile in the Mexican state of Baja California Sur. This type of data could be used to inform targeted distribution of supplies or cash transfers to the most vulnerable at-risk populations. **It can also be used as a measure of resilience.** **Blog 23** describes a big data project, called the **Partnership for Resilience and Preparedness (PREP)**, designed to help

corporations make **long-term infrastructure decisions** by improving their climate resilience planning. Instead of relying on static reports or sifting through hundreds of sources with conflicting and confusing data, PREP will provide dynamic data, climate reports and projections from directly sourced scientific sources as they become available. As the project progresses, users will be able to create customised climate risk dashboards.

2.8. Eco- and nature-based approaches

Blog 6 tells the ongoing story of agroforestry. Wanjira Mathai believes that the solution lies in the use of trees to support healthier and more productive farms. Trees can help farms restore soil nutrients, reduce

erosion and retain water. Her pressure has helped the Kenya government commit to restoring 12.6 million acres of degraded forest, watersheds and other important landscapes by 2030.

In the face of the growing financial and physical impacts of climate change and severe weather in the US, the **most shared resilience blog** of July to December 2016 (**blog 1**) highlights the evidence of greener, better, cheaper and smarter solutions using natural systems. **Living shorelines** utilise a combination of structural and natural materials – such as wetlands, marshes, sand dunes, mangroves or coral reefs – combined with coir fibre logs, sand fill and stone. They can reduce wave intensity, prevent erosion and provide a host of other economic and environmental benefits.



Woman carrying water, Lodwar town in Kenya. Rob Hope/REACH, 2016. CC BY-ND 2.0.

3. Resilience in the grey literature

Our examination of the material on resilience published in the grey literature in 2016 Q4 includes 37 publications from research and private sector institutions, donors, humanitarian and multilateral agencies. These span seven broad themes:

1. financing and measuring resilience
2. urban and infrastructure resilience
3. food security, agriculture and livelihoods
4. social inclusion and social protection
5. Agenda 2030
6. climate change and disasters
7. governance and resilience.

Compared with last quarter's Scan, there has been an increase in the attention to Agenda 2030 and a decrease in the discussion of migration.

3.1. Financing and measuring resilience

Grey literature on financing and measuring resilience suggests:

- when given autonomy, communities tend to focus on building resilience to immediate threats rather than building adaptive long-term capacity
- insurers are uniquely positioned to build resilience due to their combination of underwriting and asset management activities, their access to extensive data and their engagement in multiple spheres of economic activity
- the need for analysis of the overall context in which people live as well as the development of a critical awareness of people's own social reality
- the importance of strong partnerships built on mutual understanding, trust, respect, transparency and equity.

Frameworks, guides and methods for financing and measuring resilience represent the most discussed theme in the grey literature from October to December 2016. Four items present or evaluate frameworks for building resilience within development programming (Ospina and Heeks, 2016; Gupta et al., 2016b; Sterrett, 2016; Villanueva et al., 2016), while another four add to the growing body of

literature on finance for resilience (Brahmbhatt et al., 2016; CISL, 2016; IFRC, 2016; World Bank, 2016).

Ospina and Heeks (2016) present the Resilience Assessment Benchmark and Impact Toolkit (RABIT), which can be used to strengthen the resilience impact of planned or previously implemented development interventions. The toolkit's implementation is linked to concrete stages of the project cycle and describes resilient systems as having three foundational attributes, supported by six enabling attributes (see Table 4).

The RABIT toolkit was used to identify how information and communication technology (ICT) can strengthen resilience by facilitating collaboration and the rapid flow of information. Nevertheless, in supporting global supply chains at the expense of local supply chains, ICT may also weaken community resilience.

Gupta et al. (2016b) also present a manual for building resilience, but one that has been developed specifically for use by Indian State Disaster Management Authorities to help them integrate CCA and DRR into their development planning. The manual helps actors understand infrastructure resilience and safety (through a specifically designed Critical Infrastructure Protection Framework) and provides opportunities to link international and national perspectives in relation to CCA and DRR (including the provision of a map of international post-2015 frameworks and their subnational implementation).

Rather than presenting a new framework or methodology for building resilience, Villanueva et al. (2016) outline insights from the first implementation year of the Building Resilience and Adaptation to Climate Extremes and Disasters (BRACED) programme (see Figure 3). One of the challenges identified is in building adaptive capacity for climate change as, when given autonomy, communities tend to focus on building resilience to immediate threats rather than longer-term changes. This first-year review yielded six key messages, which include recommendations for implementing partners at the project level, as well as for the wider programme.

Principles of effective programming, good-practice guides, tools and resources for building resilience presented by Sterrett (2016) support the observations produced by Audia et al. (2016) under the governance theme in

Table 4. Attributes of resilient communities: summary of definitions and key markers

Attributes	Definition
Foundational attributes of community resilience	
Robustness	Ability of the community to maintain its characteristics and performance in the face of environmental shocks and fluctuations.
Self-organisation	Ability of the community to independently rearrange its functions and processes in the face of an external disturbance, without being forced by external influences.
Learning	Capacity of the community to generate feedback with which to gain or create knowledge and strengthen skills and capacities. Closely linked to the community's ability to experiment, discover and innovate.
Enabling attributes of community resilience	
Redundancy	Extent to which community resources and institutions are substitutable; for example, in the event of disruption or degradation.
Rapidity	Speed at which assets can be accessed or mobilised by community stakeholders to achieve goals in an efficient manner.
Scale	Breadth of assets and structures a community can access to effectively overcome, bounce back from or adapt to the effects of disturbances.
Diversity	Availability of a variety of assets, institutions and institutional functions in the system, which enable a range of response options.
Flexibility	Ability of the community to undertake different courses of actions with the resources at its disposal, while enabling them to innovate and utilise the opportunities that may arise from change.
Equality	Extent to which the community provides equal access to rights, resources and opportunities to its members.

Source: adapted from Ospina and Heeks (2016).

section 3.7. Sterret et al. (2016) argue that, prior to building resilience, a strong understanding of the context must be gained through 'reflection-action'. This participatory methodology provides an analysis of the overall context in which people live, as well as a critical awareness of people's own social reality. The process supports people's agency to challenge inequalities and build their own resilience. The social reality or context is divided into four main areas that need to be analysed prior to initiating resilience-building activities: vulnerability and capacity, women's rights, power, and actors and institutions.

The final three texts within this theme focus on finance, with one specifically discussing the role of the insurance industry in building societal climate resilience, the second discussing incentives and barriers for investing in resilience more broadly, and the final text focusing on finance for

Figure 3. BRACED: key insights from practice



Source: adapted from BRACED (2016).

urban resilience. CISL (2016) argues that insurers are uniquely positioned to lead the societal changes required to build resilience, due mainly to their combination of underwriting and asset management activities, their access to extensive data and their engagement in multiple spheres of economic activity. The report provides an assessment of the current resilience landscape and conclude that an easily understandable universal climate resilience rating system would enable resilience to be considered across many areas of decision-making such as asset management, policy-making and risk management, which would enhance the activities and ability of insurers to help build resilience.

The IFRC's 2016 *World Disasters Report* (IFRC, 2016) provides a broad picture of the many financial and social incentives for investing in resilience. It highlights ways to overcome or reduce barriers, while also protecting

Given autonomy, communities tend to focus on building resilience to immediate threats rather than longer-term changes

the needs and rights of the poorest and most vulnerable. The report establishes a strong link between psychosocial support and resilience, highlighting the need for increased work in this area. It also underlines the importance of strong partnerships built on mutual understanding, trust, respect, transparency and equity, and highlights the growing opportunities for partnerships in urban contexts and within the private sector. Finally, the report examines resilience in the contexts of future climate change, violence and conflict, and discusses opportunities for dealing with complex risk.

The final text in this theme highlights that rapid urbanisation sees the economic cost of disasters increase, with a disproportionate impact on the urban poor (World Bank, 2016). The report makes the case for taking advantage of future infrastructure investment to build in resilience investments. The World Bank proposes that it can support building urban resilience through financing products and services as well as leveraging private finance through the strategic expansion of co-financing, lending, guarantees and other risk-management instruments.

Finally, on a more regional scale, Brahmabhatt et al. (2016) provide an integrated approach for tackling economic, social and environmental concerns. This approach argues that climate resilience can be achieved through rapid economic transformation and growth, supported by targeted public investments and adaptation programmes. Drawing on a detailed analysis of economic transformation and socio-environmental change in sub-Saharan Africa since the 1960s, the report focuses on four priority areas: (1) modernising and improving agriculture and land use; (2) diversifying economies into high-productivity modern sectors, such as internationally tradable services and high value-added agriculture; (3) making the most of urbanisation through urban development strategies and exploiting new emerging technologies; and (4) accelerating sub-Saharan Africa's modern energy transition.

3.2. Urban and infrastructure resilience

Grey literature on urban and infrastructure resilience suggests:

- leveraging private finance for urban resilience is possible through strategic expansion of co-financing, lending, guarantees and other risk-management instruments
- green infrastructure must be the foundation for town planning and development

- risk governance is an effective decision-making framework to help address urban resilience
- urban development plans, governance systems and budgets must adequately account for the specific needs of children.

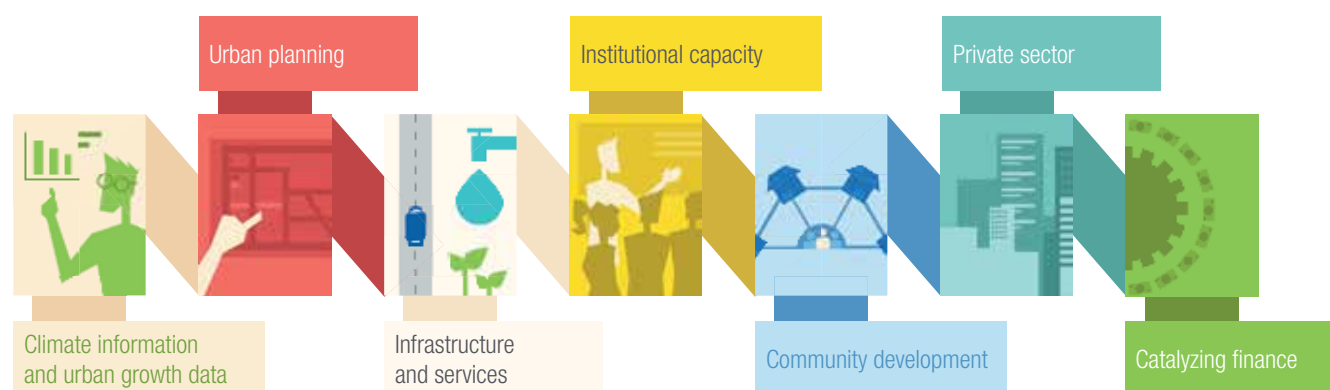
Five of the 37 grey publications presented here focus on urban and infrastructure resilience, with the role of the private sector appearing as a common theme throughout. The first item within this theme presents entry points for strengthening urban resilience (Bahadur et al., 2016), while two publications focus on the integration of natural resource management and green infrastructure (ADB, 2016; Tayal and Singh, 2016). Two more discuss issues around urban governance (Knopman and Lempert, 2016; Plan International and ARUP, 2016).

Drawing on an analysis of a large body of urban resilience literature and examples of practice, Bahadur et al. (2016) provide seven entry points for action to strengthen urban climate change resilience: (1) data, information and knowledge generation/sharing on the relationship between climate change and urban growth; (2) forward-looking urban planning tools; (3) organisational systems that support resilience and a recognition of the interconnections between sectors; (4) a focus on strengthening institutional capacity for urban development; (5) the importance of community engagement and community-based organisations; (6) a focus on engaging the private sector; and (7) the need to catalyse finance from different scales of governance.

Tayal and Singh (2016) highlight the importance of integrated management of water, energy and food in urban India. Based on current Indian policy and programmes, the policy brief highlights the need to integrate both food and watershed management into urban development plans. To increase efficient resource use, the brief recommends the establishment of water- and energy-efficiency labels/ratings for consumer appliances, market decentralisation to reduce transport and food waste, and the use of waste in local energy systems. Finally, the report advocates behavioural change towards the consumption of sustainable foods through public awareness campaigns. The publication by ADB (2016) supports integrated urban planning and management, arguing that green infrastructure and nature-based solutions should become an integral part of conventional town development planning. The book highlights examples from three projects in Cambodia, Viet Nam and Lao PDR that include green roofs and walls and using the natural environment to manage water, temperature and air quality. The work notes that green infrastructure should be implemented across different sectors, with the participation of communities, and must be multipurpose (e.g. recreational as well as practical).

Knopman and Lempert (2016) present a decision-making framework and indicators for urban resilience to climate change, based on risk governance. The paper

Figure 4. Seven entry points for action to strengthen urban climate change resilience



Source: adapted from *Building Resilient Cities: 7 Entry Points for Urban Climate Change Resilience* (video), produced by the Urban Climate Change Resilience Trust Fund, October 2016, as appears in Bahadur et al. (2016). Reproduced with permission.

argues that a risk governance approach provides a multi-actor, decision-centric perspective and recognises that climate change responses are more than technical in nature. The framework is made up of three tiers:

- actions that can be taken by existing departments in city government, groups and collaborations among them
- actions that involve relatively minor changes in law or institutional structures at the local, state or national level
- more significant changes in laws, regulations, funding and institutions at the state and national levels in which cities operate.

Also drawing heavily on governance approaches, Plan International and ARUP (2016) present a new framework to guide resilience building that supports children and integrates child and human rights into resilient urban development. The framework is built upon three guiding concepts: urban systems thinking, a strength-based approach (leveraging resilience already shown by children) and a rights-based approach. The report highlights children's vulnerabilities, particularly in informal settlements, and notes that current urban development plans, governance systems and budgets do not adequately consider children's specific needs.

3.3. Food security and agriculture

Grey literature on food security and agriculture (FSA) suggests:

- flexible governance systems are crucial for delivering transformation towards climate-resilient food systems
- the need for low-cost and low-carbon technologies that lead to increased resilience and food security

- fertiliser subsidies and access to credit can promote specialisation and disincentivise income and crop diversification
- the need to work with individuals and groups to increase coordination between communities of practice working on gender, resilience and CCA.

The theme of FSA features in four of the grey literature publications this quarter, with one publication discussing transitional pathways into climate-resilient food systems (FAO, 2016), two examining specific adaptation activities (Aslihan et al., 2016; Morris et al., 2016) and one which discusses the role of women in food and nutrition security (Gnisci, 2016). It is also worth noting that two further publications in section 6 examine food security and sustainable agriculture in the context of the SDGs and Agenda 2030 (FAO/UNISDR, 2016; Swiderska et al., 2016).

FAO (2016) presents the results of a Knowledge Share Fair in Burkina Faso in 2013 where a group of organisations came together to develop good practices under five different themes to strengthen resilience to food and nutrition insecurity in the Sahel and West Africa. Under **sustainable natural resource management and climate change**, they advocate the use of low-cost and low-carbon technologies, highlighting the importance of land tenure security to ensure sustainable investments. The second theme, **livestock with a particular focus on pastoralism**, includes the need for pastoral policies that consider sub-regional integration and a legal framework to oversee pastoral mobility in the West African region. The **reduction of food and nutrition insecurity** theme features the use of improved seeds. Theme four, **management of risks, threats and crises**, features the Regional System for Food Crisis Prevention and Management (PREGEC) and index-based insurance

as examples of best practice. The **social protection theme** advocates additional investments in social protection by governments and technical financial partners.

The review by Morris et al. (2016) of climate change impacts and adaptation for smallholder coffee farmers finds that incorporation or maintenance of shade trees (i.e. coffee agroforestry) delivers benefits for the greatest number of agronomic and livelihood resilience indicators. Enhancing shade cover helps regulate micro-climates, retain soil moisture and water infiltration, reduce erosion and maximise nutrient efficiency and yield. It also represents a low-cost, low-carbon method for smallholder coffee farmers to build the resilience while also supporting food security and increased income generation. Aslihan et al. (2016) show that long-term variation in rainfall patterns during the growing period leads to diversification into and within livestock activities in Zambia. The presence of agricultural extension staff improves crop and livelihood diversification, but diversification was significantly lower among smallholder farmers and female-headed households, suggesting the need for more targeted rural policies. Fertiliser subsidies disincentivised income diversification by increasing on-farm productivity and thereby reducing push factors to other income activities.

Finally, Gnisci (2016) provides examples from West Africa to show how women's empowerment on the one hand, and 'food and nutrition security and resilience' on the other, are mutually reinforcing. The 2016 OECD/World Bank report highlights, for example, how unequal power within the household, the burden of care work and household tasks, along with the lack of legal and economic rights to control productive resources, constrain women's agricultural productivity. The report also notes the potential and current contribution of women to protecting the environment, formulating food-related policies and decision-making.

3.4. Social inclusion and social protection

Grey literature on social inclusion and social protection suggests:

- social protection programmes need to consider the implications of climate risk in the design phase
- the need for humanitarian actors, the private sector and donors to support more equal roles for women through longer-term support to their business and livelihoods
- the need to explicitly target investments towards the poorest and most excluded in society.

Two of the grey literature publications focus on social inclusion (Pedrajas and Chortiz, 2016; UNDESA, 2016) and two focus on social protection (CARE, 2016; Ulrichs and Slater, 2016).

A BRACED Working Paper draws on empirical and desk-based research to examine the role of social protection programmes in contributing to the climate resilience of the poorest and most vulnerable people (Ulrichs and Slater, 2016). Three case studies in Ethiopia, Kenya and Uganda find that the projects reviewed currently make a strong contribution to people's resilience through well-implemented regular cash transfers. However, there is a lack of evidence on the contribution of social protection to long-term adaptation and sustainable livelihoods. The paper concludes that social protection programmes need to consider the implications of climate risk in the design phase of projects to harness potentially positive impacts on adaptation and avoid any maladaptive practices. Moreover, it was found that the contribution of social protection programmes to resilience is strongest when their objectives are in line with the design and implementation capacity to deliver in a predictable and timely manner.

Similarly, a CARE Briefing Paper (CARE, 2016) discusses social protection, but centres on the empowerment of women and the resilience of market systems in fragile contexts. Drawing on work by CARE and others, the paper makes recommendations to enhance anticipatory, absorptive and adaptive capacities (see Table 5).

Table 5. Fostering female economic empowerment and the resilience of market systems in a fragile context

Capacity	Recommendation
Anticipate	Incorporation of market systems thinking within an organisation's preparedness planning, which should also include a strong gender lens
	Large actors to underwrite the risks to smaller parts of the market system
Absorb	Humanitarian actors to support cash programming alongside deliberate gender transformation strategies
	Businesses to generate social positive impacts in fragile contexts and monitor their contribution to building cohesion and stability
Adapt	Prosperity and economic development strategies to be focused on both the macro and micro levels with approaches that seek to address fragility and risk through investment in formal and informal economies
	Humanitarian actors, the private sector and donors to support more equal roles for women through longer-term support to their business and livelihoods
	Political business leaders to do more to value the economic and social contribution of refugees

Source: adapted from CARE (2016).

Pedrajas and Choritz (2016) highlight ‘the last mile’, which describes the poorest in society, and those people, places and small enterprises that are underserved and/or excluded. The ‘last mile’ also recognises where development needs are greatest and resources scarcest. Drawing on six different case studies from least developed countries (LDCs) around the world, the paper looks at the structural, financial, political and social drivers of the exclusions and inequalities that keep people and places in persistent poverty. The case studies inform eight different recommendations of the ‘last mile action agenda’. This agenda highlights the need to explicitly target and prioritise predictable and sufficient investments in the ‘last mile’ that enable tailored interventions to specific ‘last mile’ environments. Moreover, the paper stresses that public finance must lay the groundwork for other public and private finance, and interventions must build capacity at the national and subnational level to ensure lasting resilience. Finally, the paper recognises the need to invest in further research to help understand the relationship between exclusion, inequalities, discrimination and poverty.

The last publication in this theme goes some way to addressing the final recommendation in the ‘last mile action agenda’, by assessing the uneven impacts and structural underpinnings that aggravate the exposure and vulnerability of populations to climate hazards (UNDESA, 2016). The World Economic Social Survey 2016 shows how integrated modelling frameworks can contribute to the assessment of the impacts of climate hazards and policies on natural resources, income distribution, human capital, access to public services and resources, socioeconomic vulnerabilities and characteristics of disadvantaged groups. The survey advocates international sources of stable, predictable and sufficient sources of financing, and the need for strengthened capacities to produce reliable and substantial data.

3.5. Agenda 2030 for Sustainable Development

Grey literature on Agenda 2030 for Sustainable Development suggests:

- coherence and cooperation across the frameworks and sectors is key to building resilience comprehensively and efficiently
- migration and climate resilience are both considered independently in the SDGs, but without explicit connections
- the need to advance child-centred DRR and CCA in Agenda 2030 through targets and pledges
- genetic diversity preserved by indigenous knowledge and practice provides a valuable resource for improving food security and adapting to climate change.

The World Economic Social Survey 2016 shows how integrated modelling frameworks can contribute to the assessment of the impacts of climate hazards and policies

Six of the grey literature publications this quarter discuss the SDGs and related Agenda 2030. One considers the treatment of resilience across multiple post-2015 frameworks (Peters and Tanner, 2016), while another discusses the implementation of frameworks at the national level (Gupta et al., 2016a). Two further publications focus on the role of specific issues within the agenda: migration (Wilkinson et al., 2016) and children (Reed and Friend, 2016); while the final two publications examine how the agenda can support food security and sustainable agriculture (FAO/UNISDR, 2016; Swiderska et al., 2016).

Peters and Tanner (2016) consider the treatment of resilience within four post-2015 frameworks: the Paris Agreement, the Sendai Framework for Disaster Risk Reduction, the SDGs and the World Humanitarian Summit. The paper argues that when considered together, these frameworks create a more complete resilience agenda. To enhance coherence and cooperation, the paper recommends that: (1) solutions which deliver resilience across the global frameworks are pursued; (2) delivery on one framework is consistent with the attainment of others; (3) coordination and collaboration needs to be incentivised; (4) finance for resilience needs to be mapped, assessed and coordinated; and (5) progress needs to be tracked jointly to better inform decision-making. Gupta et al. (2016a) set out the Indian Prime Minister’s Agenda 10 on Disaster Risk Management, developed to meet the DRM goals of the Sendai Framework, the Paris Agreement and the SDGs.

Wilkinson et al. (2016) discuss climate-induced migration and the major post-2015 international frameworks. The briefing highlights that migration and climate resilience are considered independently in the SDGs rather than as interrelated issues. Without strategies to tackle this link, the projected impacts of climate-induced migration will result in major challenges to the implementation and achievement of SDG 13. Moreover, the briefing finds that none of the other main frameworks for addressing climate-induced migration wholly captures its complex dynamics. It particularly highlights the fact that displacement can lead to further risk accumulation in cities, but that climate policies often fail to predict and incorporate future migration. The briefing posits that voluntary climate-induced migration can, and should, be supported and planned for as an adaptation strategy.

Reed and Friend (2016) examine what each of the six central agreements of Agenda 2030¹ means for child-centred DRR and CCA, and the potential opportunities and gaps in the agreements that need to be considered. Of the six agreements, the SDGs and seven targets of the Sendai Framework were highlighted as having the strongest mechanisms for monitoring the specific needs of, or impacts on, children. The Paris Agreement has fewer pledges relevant to children, despite being the only legally binding framework of the six mentioned. The paper advocates for the advancement of child-centred DRR and CCA through targets and pledges, the strengthening of national review processes, child participation in monitoring and implementation, child-centred thematic reviews, and finally a focus on how Agenda 2030 is influencing other policy-makers, donors and child rights, as well as intergenerational equality on a wider scale.

Both FAO/UNISDR (2016) and Swiderska et al. (2016) examine methods of improving FSN as well as developing sustainable agriculture as mandated within post-2015 frameworks. FAO/UNISDR (2016) provides a set of guidelines and recommendations for the implementation of the Sendai Framework in the agriculture and FSN sector, structured around the Framework's four priority areas. An IIED briefing (Swiderska et al., 2016) presents evidence from the Smallholder Innovation for Resilience project in Kenya, India, China and Peru showing that genetic diversity preserved by indigenous knowledge and practices provides a valuable resource for improving food security and adapting to climate change. Such practices can help enhance productivity, income and resilience in harsh environments, all of which contribute to SDG 2 ('End hunger, achieve food security and improved nutrition, and promote sustainable agriculture'). The paper argues that traditional varieties of seed species should be conserved and improved through community seed banks, community-managed landscapes and participatory plant breeding, and that there should be enhanced access to markets for traditional products.

3.6. Climate change and disasters

Grey literature on climate change and disasters suggests:

- disasters affect well-being more than traditional estimates of economic loss suggest
- international non-governmental organisations (INGOs) and non-governmental organisations (NGOs) require flexible funding and adaptive programming to innovate, protect development gains and respond to the most pressing needs during a crisis
- climate change can provide opportunities for micro, small and medium enterprises (MSMEs) through the exploitation of new climate-resilient products
- accessing water and collecting fuelwood, in particular, have become increasingly time-consuming in the context of climate change, and adaptation initiatives therefore need to minimise these activities in order to address rural women's time poverty.

Five publications in this quarter are explicitly oriented at climate and disaster resilience. Within these, sub-themes include rethinking the traditional means of measuring disasters (Hallegatte et al., 2016), using lessons from past disasters to improve resilience to extreme weather events (Singh et al., 2016), climate resilience along value chains (Dekens and Dazé, 2016), finance for resilience in Small Island Developing States (SIDS) (OECD/World Bank, 2016) and gender-responsive adaptation (Pionetti, 2016).

Hallegatte et al. (2016) argue that the traditional approach to assessing the economic impacts of disasters fails to include people's well-being, thereby missing the real impact on the poor and most marginalised. This flaw passes into appraisal of DRR projects, meaning that they may favour the protection of wealthier people or communities as opposed to those most in need. The study provides a metric that captures the overall impacts of disaster risk and losses on poor and non-poor people even if the economic losses of poor people are small in absolute terms.

OECD/World Bank (2016) finds that climate and disaster resilience financing is mostly provided in the form of grants, and while concessional financing is mainly targeted towards selected upper middle income countries, it is shrinking in aggregate terms for SIDS. The relative weight of different donors varies across geographical regions, but most SIDS depend heavily on a single donor, exacerbating their financial vulnerability. Moreover, climate and disaster resilience financing was found to be fragmented across many complex projects that are not equally or representatively distributed across individual SIDS when measured per capita.

A report for the BRACED programme uses a snapshot of the 2015–2016 Ethiopian drought to examine the most effective approaches for building resilience in the face of extreme weather events (Singh et al., 2016). The report concludes that insurance mechanisms can be an important protection tool, but they require greater accessibility for vulnerable people and must be coupled with anticipatory and responsive actions in coordination with other actors. It also notes that an early response costs less and produces better outcomes, so early funding trigger mechanisms are needed based on pre-agreed indicators of risk.

1 The SDGs, the Paris Agreement on Climate Change, the Addis Ababa Action Agreement on Finance for Development, the Sendai Framework on Disaster Risk Reduction, the World Humanitarian Summit (WHS) and the Habitat III New Urban Agenda..



Cooks prepare meals for students in Liberia. Photo credit: Dominic Chavez/World Bank, 2015. CC BY-ND 2.0.

The study provides a metric that captures the overall impacts of disaster risk and losses on poor and non-poor people even if the economic losses of poor people are small in absolute terms

A case study of a small domestic seed company in Uganda provides recommendations for supporting climate risk management along value chains (Dekens and Dazé, 2016). Despite acknowledging the cascading potentially negative impacts of climate change along these value chains, the authors highlight the opportunities for MSMEs to benefit from such changes, for example through the sale of climate-resilient seeds. The briefing note recommends enhancing the capacity of small agri-businesses to integrate climate risks into their decision-making process and to explore their role as potential climate knowledge brokers.

Pionetti (2016) draws on findings from Cabo Verde, Cambodia, Haiti, Mali, Niger and Sudan to examine gender-responsive adaptation strategies in the context of the Canada-UNDP Climate Change Adaptation Facility. The publication finds that with diminishing livelihood

opportunities, an increasing number of men are migrating on a temporary basis in search of alternative incomes. Accessing water and collecting fuelwood, in particular, have become increasingly time-consuming in the context of climate change. Therefore, adaptation initiatives need to minimise these activities to address rural women's time poverty. The report argues that measures must be designed to promote women's control over financial resources and women's leadership. The report also stresses the importance of targeting and supporting those who are most at risk, such as female-headed households, girls and young women.

3.7. Governance for resilience

Grey literature on governance for resilience suggests:

- previous NGO presence can benefit resilience-implementing activities and the depth/breadth of changes by providing pre-existing data and supporting structures
- the need for greater integration between national scientific institutions producing climate services and local informal institutions better placed to disseminate information
- the importance of social groups and, increasingly, NGOs and the private sector in delivering financial services

-
- the need for governance systems to provide sufficient economic and social capital as well as the flexibility to allow innovation to emerge and gain strength.

The final four grey literature publications this quarter focus on the role of governance in building resilience. Three discuss how governance arrangements mediate access to services essential to building resilience (Audia et al., 2016; Carabine et al., 2016; van Bers et al., 2016). The fourth publication presents the United Nations Development Programme's (UNDP's) new Governance and Peacebuilding Cluster and its links to resilience (UNDP, 2016).

Carabine et al. (2016) examine how governance arrangements mediate access to ecosystem, climate and financial services in the Sahel and Horn of Africa. The report concludes that ecosystem services delivered at the local level are governed by complex institutional arrangements. It favours greater integration between national scientific institutions and local informal institutions that are better placed to disseminate the information. The report also highlights the importance of social groups and, increasingly, NGOs and the private sector in delivering financial services, and suggests this warrants further examination. Van Bers et al. (2016) expand on these findings and highlight that governance systems are crucial for delivering transformation towards climate-resilient food systems by providing sufficient economic and social capital as well as sufficient flexibility to allow innovation to emerge and gain strength.

Audia et al. (2016) draw on the BRACED programme in Ethiopia and Burkina Faso to show how social processes, relationships and behaviours affect the balance between the components of Béné et al.'s (2012) absorptive capacity,

Ecosystem services delivered at the local level are governed by complex institutional arrangements

adaptability and transformability (AAT) framework for resilience. Initial observations include: (1) previous experiences of food aid and NGO presence will affect implementing activities and the depth and breadth of changes undertaken, (2) traditional knowledge and socio-cultural community organisation can influence maladaptive decision-making, (3) uptake of scientific information national forecasting may be difficult in areas where traditional forecasting techniques are commonly used; and (4) resilience programmes can underestimate the impact of political and climate shocks on the evolution of local and national institutions.

UNDP (2016) describes resilience as not only referring to the ability of societies to managing and rebound from disruptions, but also as a means of focusing on the interactions and processes between groups in society that require a strong state–society social contract. Reflecting the ActionAid Framework for Resilience outlined in the last quarter's Resilience Scan, UNDP promotes a rights-based approach to resilience that considers the rights and freedoms of all peoples. The paper recognises multiple and interconnected social, political, economic and environmental risks, and highlights the need to build resilience to external and domestic threats and vulnerabilities. In response to recent thinking on development and peace-building, UNDP describes a shift in approach towards democratic governance, conflict prevention and peacebuilding.

4. Review of resilience in the academic literature

The review in this quarter includes 32 peer-reviewed journal articles on resilience. Six dominant themes emerged:

1. community resilience and cooperation
2. policy, planning and governance for building resilience
3. concepts, indicators and measurements
4. power and politics of resilience
5. urban resilience
6. agriculture and rural livelihoods.

4.1. Community resilience and cooperation

Academic literature on community resilience and cooperation suggests:

- participatory community-based approaches can help to integrate different types of knowledge within resilience initiatives
- internationally led development and conservation efforts are often unsuccessful because they do not sufficiently understand local context, disregard local knowledge and lack engagement with local communities
- community-driven efforts for urban poverty reduction and development can create co-benefits for climate resilience by decreasing exposure and reducing the underlying physical, economic and social drivers of vulnerability
- shared assets and resources support the long-term coping capacity of a community, given that these community capitals are invested in collective well-being
- collaboration among small-scale fisheries in customary tenure systems supports their resilience in the face of ecological, social and economic shocks.

The active involvement of diverse stakeholders, including scientists, citizens, governments and the private sector, is necessary to understand and address the complexity of building community resilience. Borquez et al. (2017) describe a shift in science and society interactions – from understanding them as a simple exchange of research for

funding towards an increasingly collaborative relationship in which participatory approaches and the co-production of knowledge by different stakeholders translate resilience theory into practice. The study conducted multi-stakeholder workshops in three Chilean regions (Santiago Metropolitan, Biobío, Los Ríos), concluding that such **participatory approaches enrich knowledge and stimulate learning among participants. They include knowledge gathering, sharing, integration, interpretation and, where these processes are related to political decisions, knowledge application.** To be successful, participatory approaches require long-term collaboration, close attention to how various stakeholders understand resilience in different ways and encouragement of diverse participation.

Community involvement in DRR measures can support resilience by building on local knowledge, needs and resources. At the same time, these approaches face challenges, including the absence of robust, long-term systems to monitor hazards. Liu et al. (2016) present an example of a community-based monitoring mechanism for landslide-prone parts of the Three Gorges Reservoir in China. Following an initial investigation of risks under the programme, local residents receive education and training and are involved in data collection to complement real-time monitoring of landslide deformations. Monitoring activities carried out by selected residents are based on simple, effective, cheap and robust techniques, supported by mobile phones, including the measurements of cracks and distances and routine observation walks. The various sources of information then feed into early warning and emergency response systems that help residents prepare for and cope with disasters.

Two articles describe the importance of communities driving resilience efforts. Archer (2016) highlights how **community-driven efforts for urban poverty reduction and development can create co-benefits for climate resilience** by reducing exposure and the underlying physical, economic and social drivers of vulnerability. **These co-benefits can be realised even if adaptation and resilience were not the initial aims of the initiative.** Key urban stakeholder partnerships, capacity building and innovative financial instruments can scale-up community-driven action and eventually contribute to urban socio-political transformation. This reshapes power relationships and

inequalities on a broader scale, but requires relationships between high-level stakeholders and bottom-up initiatives.

Doughty (2016) argues that internationally led development and conservation efforts are often unsuccessful because they do not sufficiently understand local context, disregard local knowledge and lack engagement with local communities. The paper studied a native tree restoration project that engages communities in Peru's Vilcanota Mountains. Under the 'representative participatory' project approach, communities take the lead on conservation and development initiatives. They are part of decision-making and implementation throughout the project cycle. Doughty (2016) finds that **the establishment of networks within and beyond communities, attention to environmental ethics and a community-driven focus on sustenance and economic development projects can strengthen social-ecological resilience to climate change.**

Collaboration *within* a community can be an additional contributor to building resilience. This is the case, for instance, among small-scale fisheries, which are exposed to ecological, social and economic changes such as resource degradation, demographic transitions and the erosion of traditional customs and practices. Researching collaborative structures based on customary marine tenure in the Solomon Islands, Hardy et al. (2016) explore how cooperation can help maintain the resilience of fishery systems confronted with such changes and sudden shocks.

Considering two different scenarios – one in which fisher communities collaborate and one in which they do not – the study assesses how long the fishery systems take to recover to a viable state in the aftermath of a shock. Within the parameters of the model, cooperation can support ecological sustainability and food security, increase cash viability and strengthen resilience, irrespective of whether the fishery system experiences a shock or not. **Although collaboration does not guarantee resilience, it results in better modelled outcomes than when cooperation is absent.**

The complexity and dynamics of community resilience have imposed difficulties on researchers and practitioners when it comes to conceptualising, operationalising and measuring resilience. Kais and Islam (2016) present a conceptual approach to the resilience of communities tied to specific locations in the context of climate change. The study views communities as key components in understanding social resilience because of their central position at the intersection of 'macro-national-global' and 'micro-individual-household' levels. It argues that shared assets and resources support the long-term coping capacity of a community in the face of climate change, given that these community capitals are invested in collective community well-being. Different dimensions of community resilience – for instance, collective efficacy or strategic thinking – can strengthen community capitals and support resilience to climate change.



Cash-for-work and disaster risk reduction in Niger. Photo credit: Fatoumata Diabate/Oxfam, 2012. CC BY-ND 2.0.

4.2. Policy, planning and governance for building resilience

Academic literature on policy, planning and governance for building resilience suggests:

- ICT data can complement standard measures for early warning and disaster impacts in a cost- and time-effective way
- resilience planning tools can stimulate learning and support informed decision-making for urban resilience planning, while they are limited by the differences in contexts and types of hazards between locations, and by viewing resilience as a co-benefit rather than a primary target in urban planning
- policies that understand forests as stable entities that can be optimised for resource production rather than as dynamic systems can increase the vulnerability of social-ecological systems
- rights-based approaches for fisheries appear to support resilience building better than open access arrangements.

Lu et al. (2016) highlight how **mobile phone data can complement standard measures for understanding disaster impact, early warning, needs assessments and response in a cost-effective, rapid way**. To generate a better understanding of how people behave before, during and after disasters, the authors assess mobile phone call records from Grameenphone users and mobile recharge purchases from vendors in a three-month window around the cyclone latterly known as Viyaru that struck Bangladesh in May 2013. Using spatial analysis, they relate unusual calling patterns to rainfall intensity, implying that calling frequency increases with physical exposure to a disaster. People in vulnerable areas also appear to prepare for disasters by purchasing recharges. Finally, the article shows patterns of movement as a response to early warnings and forecasts. Despite short-term dislocations, the authors do not find much evidence for mass displacement.

The use and regulation of natural resources are key concerns in two academic articles. Focusing on forest governance and green growth initiatives in China, Bone (2016) challenges the dominant understanding of forests as stable entities that produce timber resources in a predictable way that can be optimised for greater economic and social wealth. Building on increasing evidence and adaptive systems thinking, he claims that policy-making along these lines has left ecological and social systems more vulnerable to disturbances, because it neglects the entangled relationship between forest policy and complex forest system dynamics. The paper argues that, instead, **constant change and disturbances need to be embraced in natural resource management and policy-making to build resilience in a way that is flexible enough to adapt to sudden change**.

Ojea et al. (2016) review the evidence on the impact of four different regulatory approaches for fisheries against nine criteria of social-ecological resilience. While their review does not represent a systematic or quantifiable comparison of resilience performance between these four types, findings imply that the rights-based approaches of territorial use rights for fisheries and individual transferable quotas support resilience building better than open access arrangements.

Breckner et al. (2016) use data on insured disaster losses and private insurance penetration to investigate whether insurance can contribute to building resilience by reducing economic losses from natural disasters. The paper finds that **private insurance seems to mitigate disaster impacts, especially in developed countries. Stable institutional environments can complement insurance to increase this mitigating effect**.

While urban policy is increasingly considering adaptation to climate change, van de Ven et al. (2016) present an Adaptation Planning Support Toolbox (APST) that plugs gaps in supporting the selection of adaptation measures in early initiative and design phases. The tool provides evidence-based knowledge about different options and facilitates collaborative decision-making via two web-based mechanisms: (1) a climate adaptation app that presents relevant adaptation measures, and (2) an Adaptation Support Tool that assists the conceptual design as a basis for detailed planning. The paper concludes that the APST has effectively stimulated learning and supported informed decision-making for urban adaptation planning. At the same time, the tests revealed limitations of decision support tools in the context of CCA, including differences between various types of hazards and locations, and the understanding of climate resilience as a co-benefit instead of a primary target in urban planning.

4.3. Concepts, indicators and measurements

Academic literature on concepts, indicators and measurements suggests:

- the specific context of an intervention should determine the M&E approach used to study climate resilience planning
- recent advances in the measurement of development resilience can inform approaches to the definition and measurement of food security
- challenges related to limited data availability, expensive tools and the need for sophisticated software and technical skills can constrain effective monitoring of resilience and recovery.

Resilience can help to understand and address the social-ecological basis for development and risk but, to do so, requires clearer conceptualisations and concrete operationalisation. The **conceptual approach of Keating et al. (2017) to resilience draws on adaptive systems**

In resilience M&E, measurement can be assessed against the intervention objective, against baselines or against different definitions of resilience

thinking, emphasising dynamism and viewing sustained well-being as the desired outcome. The paper claims the framework is a more holistic approach to DRM that can better address global drivers of risk. A collaborative multi-stakeholder process resulted in an application of the concept as the Flood Resilience (FLORES) Framework for several flood-prone communities in developing countries. The framework, which includes different stakeholders with the capacity and clear mission to bring about change, can map interdependencies and address drivers of risk by outlining options for intervention, for instance in relation to land use or infrastructure. Building on the framework, Keating et al. (2017: 84) suggest a conceptual shift from focusing on risks towards placing ‘the resilience of community well-being’ at the centre of disaster and development policy.

Brown et al. (2016) review grey and academic literature on the M&E of urban climate resilience planning. Existing literature suggests that there is no common M&E approach to resilience, but also underscores the importance of taking the specific context into account when selecting methods to carry out M&E. In resilience M&E, measurement can be assessed against the intervention objective, against baselines or against different definitions of resilience. The choice of method itself may be guided, as well as constrained, by the particular definitions or frameworks, and the community priorities, that underlie the resilience initiative.

Platt et al. (2016: 449) compare different qualitative and quantitative measurements for recovery and resilience in Thailand and Pakistan to determine their cost effectiveness. The paper deploys analysis of satellite imagery, volunteered geographic information, ground survey/observation, social audit, household surveys, official statistics and insurance data. To capture the speed and quality of recovery, the article recommends a combination of the above methods and their integration within a ‘spatial temporal recovery geo-database’ for comprehensive monitoring. Restrictions to this approach include limited data availability, high requirements for software and technical skills and elevated costs of some individual tools, especially in the case of remote sensing.

Upton et al. (2016) argue that recent advances in the field of development resilience can enhance how food security is defined and measured. Tracing the evolution of food security measurement, the paper draws out a set of four ‘axioms’: (1) **scale** to relate to all people at any scale of aggregation; (2) **time** to encompass the ‘stability’ dimension of food

security; (3) **access**, capturing the notion of physical, social and economic access, including the availability dimension; and (4) **outcomes**, related to dietary, health and/or nutrition outcomes encompassing the utilisation dimension of food security. The authors use a five-year data set from Kenya to argue that multi-scalar measurements of development resilience (Barrett and Constanas, 2014) that focus on dynamic well-being have the potential to address these ‘axioms’.

4.4. Power and politics of resilience

Academic literature on power and politics of resilience suggests:

- social power structures and the relationships between local and national political systems can result in unequal access to support and to the processes of disaster recovery
- the need for a ‘decolonial turn’ in resilience thinking to explicitly highlight the role of power and settler colonialism in understanding resilience to disasters
- in addition to strengthening resilience, CSA can empower women when emphasis is placed on training and leadership
- resilience frameworks need to consider the interactions between natural disasters, history and post-colonial, racialised politics to understand marginalisation and injustices and to create a more comprehensive form of resilience.

Two academic articles in this quarter’s Scan assess the role of social, political and economic power structures in relation to resilience (Atallah, 2016; Choudhury and Haque, 2016). Bridging resilience and vulnerability thinking, Choudhury and Haque (2016) assess the adaptive capacity of wetland communities exposed to frequent flash floods in north-eastern Bangladesh. The paper concludes that social power structures determine control over resources and shape livelihoods and processes of disaster recovery. The paper highlights that encapsulation (i.e. close links and the embeddedness of local politics with larger political processes at a national scale) influences socioeconomic processes at the community level. As a result, **local community members were conditioned, chiefly by the asymmetrical social power structure, to feel helpless in the face of natural disasters**. This has created and reinforced passive, reactive and maladaptive responses. However, the paper also finds evidence of more ‘transformative’ measures, wherein community members modified or changed their behaviour to achieve longer-term sustainability and risk mitigation, such as through diversified livelihoods or seasonal migration.

Atallah (2016) argues that resilience frameworks require greater recognition of the complex relationships between natural disasters, history and post-colonial, racialised politics. These social and ecological complexities are the daily

realities of indigenous communities such as the Mapuche in southern Chile. In addition to natural disasters, systemic marginalisation, social injustice and long-lasting socio-political disasters (for example, political repression and colonisation) impose further strains on these communities, and therefore require a more comprehensive form of resilience. Atallah (2016: 97) calls for a ‘decolonial turn’ in resilience thinking, which ‘aims to explicitly highlight the role of power in resilience to disasters while relocating settler colonialism to the center of analysis’. The decolonial turn thus looks beyond the role of individuals or collectives towards structural and politicised inequalities in resilience and DRR.

Participatory knowledge generation can be influenced by political rationalities. For instance, crisis mapping – the collection and spatial assessment of big data on disasters and resilience – presents a new means for public participation in humanitarian disaster response. Drawing on MicroMappers and the Missing Maps Project as two examples, Givoni (2016) critically questions the impact of the approach, as well as the political rationalities that underlie crisis mapping. The paper argues that ICT is a mechanism for retaining security and order in crisis areas. At the same time, it can potentially deepen tensions in the humanitarian sector from trying to combine the different purposes of witnessing and increasing the visibility of disasters, while at the same time aiming to enhance resilience.

CSA aims to support resilience through measures and technologies such as conservation agriculture or multi-use water systems. In the case of western Nepal, Khapung (2016) describes a reluctance among local populations to adopt these approaches despite the efforts of aid agencies to promote CSA. Assessing the Anukulan-BRACED project aimed at building climate-resilient livelihoods in western Nepal, the paper outlines how empowerment may be supported via the introduction of CSA. The Anukulan project pays particular attention to women’s leadership and training, which includes skills, capacities and access to resources. Drawing on a range of individual narratives, Khapung (2016) concludes that the project both strengthens resilience to climate extremes and contributes to women’s empowerment.

Farley and Voinov (2016) outline the limitations of predominant economic systems for addressing planetary boundaries (social-ecological thresholds) and ensuring intergenerational justice while building resilience. The paper discusses different types of thresholds for social-ecological systems, including: (1) economic and human impacts resulting from slow changes in the availability of goods and services; (2) escalating positive feedback loops, for instance bubbles and busts, in the financial sector; and (3) technological breakthroughs. They argue that continued economic growth potentially leads to a crossing of these thresholds on a finite planet. Price mechanisms promoted by mainstream economists, according to Farley and Voinov (2016), are unable to address economic thresholds due to

persistent economic inequality and because many resources are freely available to all with no price tag. The article describes economic de-growth as a strategy to limit the risk of crossing detrimental socioeconomic thresholds. In addition, the paper advocates open source and public knowledge as a contributor to reaching technological breakthroughs, which can help to address major thresholds.

4.5. Urban resilience

Academic literature on urban resilience and infrastructure suggests:

- social inequalities and marginalisation need to be overcome to strengthen the resilience of vulnerable urban populations
- post-disaster reconstruction can represent an opportunity to ‘build back better’ and make cities more resilient
- resilience as bouncing back to the original state is not always desirable; breaking the ‘resilience’ of undesirable urban systems in the first place may be necessary to advance the agenda of sustainability, avoiding a return to the initial (unsustainable) state.

Post-disaster reconstruction processes represent an opportunity to ‘build back better’ and to strengthen resilience in an urban context. Tumini et al. (2016) assess differences in reconstruction approaches and their effectiveness for resilience in two Chilean cities after they experienced tsunamis: Mehuín in 1960 and Dichato in 2010. The paper outlines a general shift in approaches to reconstruction, with cross-sectoral and participatory efforts replacing a focus on rebuilding disaster-affected housing in the same locations. Based on an urban morphology framework, the article examines the resilience of both case study locations before and after the disasters. Tumini et al. (2016) find enhanced levels of resilience after reconstruction in both case studies. The more comprehensive effect on resilience appeared in Dichato, which the authors relate to the cross-sectoral approach to reconstruction used in this case. The paper concludes that **urban morphology – especially open space, public buildings for temporary shelter, as well as accessibility and proximity to both open and built systems – can contribute to disaster resilience and urban adaptability.**

Two articles in this Scan focus on livelihood- and asset-based approaches to resilience in urban contexts (Hossain and Rahman, 2016; Romero-Lankao et al., 2016). Romero-Lankao et al. (2016) assess the relative contributions to vulnerability of exposure, capacities and wealth among different vulnerability classes in Mumbai. While hazard exposure is a key determinant of vulnerability for the most vulnerable households, differences in capacity and wealth are the most influential components of household vulnerability in all other classes. Similarly, Hossain and Rahman (2016) study

asset-based approaches to adaptation and their contribution to poverty reduction in Dhaka. The paper concludes that the asset transfer approach is effective in supporting adaptation and resilience of extremely poor households because it strengthens their individual and collective agency, for instance through training, business support and group formation. Collective organisation and grassroots mobilisation of the urban poor can, according to the paper, help to break existing structural inequalities in this context.

The final two articles with an urban focus assess the resilience of water and waste management systems (Li et al., 2016b; Puppim de Oliveira 2016). Li et al. (2016b) present an integrated framework to analyse the resilience of urban land-water systems. Based on a study of Lianyungang, the paper looks at how river basin systems can maintain water quality in the face of external pollution, for instance resulting from industry and transport. It proposes a resilience lens drawing on the theory of adaptive capacity and adaptive cycles to guide water management. The paper finds that structural transformations in land use planning, for instance away from heavy manufacturing industries, contributed positively to the resilience of water quality. Based on these results, the paper highlights the strong interactions between sectoral urban policies and states of water system resilience.

While the prevailing narrative usually refers to strengthening urban resilience, Puppim de Oliveira (2016: 3) argues that weak governance in cities in developing countries has detrimental outcomes that are reinforced by the strong resilience of the urban system. Thus, breaking the resilience of urban systems in the first place is necessary to advance the agenda of sustainability and avoid the return to the initial (unsustainable) state. Studying solid waste management on Penang Island, the author identifies three main factors that helped to introduce reforms that weakened the ‘resilience’ of the prevailing system and improved resource efficiency, including engagement of civil society, local control of waste management and institutions that bridged the intergovernmental relations.

4.6. Agriculture and rural livelihoods

Academic literature on agriculture and rural livelihoods suggests:

- low-cost local interventions such as sand dams can be an effective tool to support management and contribute to building resilience in drylands
- flexibility, adapting practices and diversification are key strategies that small-scale farmers and pastoralists use to strengthen the resilience of their livelihoods
- shifting towards drought-resistant crops and livestock helps farmers and pastoralists to grapple with changing climate conditions.

In times of stress, farmers shift from using mainly farmer-saved seeds towards a relatively higher reliance on local markets and social networks

Five articles in this quarter’s Scan focus on the flexibility and diversity of agricultural and pastoralist practices that support the resilience of rural livelihoods (Kansiime and Mastebroek, 2016; Li et al., 2016a; Ryan and Elsner, 2016; Watete et al., 2016; Watson et al., 2016).

Kansiime and Mastebroek (2016) build on a social-ecological approach to assess cassava, maize and bean seed system resilience in the West Nile region of Uganda. The paper finds that farmers rely on a range of formal and informal sources, as well as diversity in types of seed (local, farmer-recycled and improved varieties). During times of stress, commonly employed seed-related strategies are an increase in seed density, a change in crop variety to more tolerant types and changing crop mix. More specifically, in times of stress, farmers shift from using mainly farmer-saved seeds towards a relatively higher reliance on local markets and social networks. However, social networks can be weakened, for instance when all are affected by a drought. In addition, access to seeds is largely determined by income, which may impede farmers’ ability to draw on alternative seed sources during times of hardship. **Building resilience of seed systems for farmers therefore requires integrated approaches that take the fragility of social networks and issues of affordability into account.**

Focusing on pastoralist livelihoods, Watete et al. (2016) assess livelihood diversification across poor, middle-income and rich households in the Mandera and Turkana counties of Kenya. The paper finds that the number of income sources, distance to water source, education level of household head, tropical livestock units held, durable index (a measure of physical asset ownership) and age of the household head influenced the choice of livelihood strategy (pastoral, agro-pastoral or off-farm). The paper emphasises the importance of promoting activities such as education and better access to water to encourage adoption of non-livestock-based income-generating activities.

Watson et al. (2016) assess pastoralists’ strategies to enhance resilience to environmental stresses and shocks in Northern Kenya. In particular, the paper focuses on the increasing tendency of pastoralists to pursue camel-herding in Marsabit County. Reasons for the growth in camel ownership include the animals’ drought resistance, their economic value, the nutritional and economic contribution of the milk and their support to other livelihood activities, such as carrying water, ploughing or through hiring the

animals out. In addition, study respondents underscored the lower requirements for labour and valued the new cooperation between husbands and wives that camel-rearing stimulated in many cases. Contrary to expectations, the shift to camels did not result in cultural ramifications or conflicts between ethnic groups that ventured into camel-herding and longer established camel-owners. Nevertheless, Watson et al. (2016) argue that camel husbandry can only be a successful adaptation strategy and increase resilience if the climate becomes drier and warmer. Furthermore, camel-borne diseases may result in economic losses and threats to human health, expose pastoralists to new market-related risks and exacerbate inequity due to the high amount of knowledge and capital required for animal herding.

Li et al. (2016a) analyse the adaptive strategies households rely on when faced with interventions that set aside land for conservation. In China's Loess Plateau, these strategies include changes in agricultural practices, intensification, diversification and off-farm labouring. The paper finds that younger, but farm-skilled, heads of household and those with relatively more family labour have higher levels of resilience. Economic resilience and the ability to reorganise is higher where women participate in meetings and training, savings are higher, people receive less in subsidies from the conservation policy programme, people have at least half their land under cultivation (where the other half is set aside for conservation) and they have access to agricultural equipment and facilities.

This evidence implies that sand dams contribute to buffering periods of water scarcity and enhance resilience in the face of drought events

Ryan and Elsner (2016) assess the adaptive capacity of sand dams in southern Kenyan drylands. Sand dams aim to support dryland agro-ecosystems by storing water, raising groundwater levels, protecting water from contamination and evaporation, and filtering water through layers of sand. Using spatial analysis of satellite images, the authors empirically test the relationship between sand dams and vegetation. The paper finds that the vegetation index is consistently higher at sand dam locations compared to sites without dams. This empirical evidence implies that **sand dams contribute to buffering periods of water scarcity and enhance resilience in the face of drought events**. In addition, they suggest that dam sites recover more quickly,

increase vegetated land cover and provide higher levels of soil moisture through groundwater improvements. This strengthens the resilience of agro-ecosystems and supports livelihoods in periods of water scarcity.

Understanding climate impacts and responses is a further concern of the academic literature on rural livelihoods in this Scan (Descheemaeker et al., 2016; Hussain et al., 2016). **Drawing on a large-scale survey of households in river sub-basins in the Himalayan Hindu-Kush region, Hussain et al. (2016) find that a majority of farmers attribute increasingly frequent disasters, such as landslides, floods, droughts or livestock diseases, to climate change.** The impacts they experience include reduced access to water, declining crop production, decreasing interest of young people in agriculture and labour shortage due to migration. Adaptation strategies that households have adopted include disaster preparedness practices, diversifying towards more resilient and higher value crop varieties, and adjusting agricultural practices, for instance through water conservation or different sowing times. Hussain et al. (2016) also describe decreasing income and consumption from agriculture due to climate vulnerabilities and reliance on uncertain markets. In times of environmental shocks, most households experience transitory food insecurity because of disaster-related loss and destruction.

Descheemaeker et al. (2016) suggest an integrated systems approach to assessing climate impacts on African small-holder farms. The paper considers the impacts of climate change on crop, livestock and grazing land and look at interactions between these three components across time and space. Based on the concept of CSA, the paper outlines the different options of mixed crop-livestock systems to contribute to food security (through enhancing agricultural productivity), to adaptation and resilience and to the mitigation of climate change. At the same time, they point to the low rate of adoption of these mixed systems among African smallholders. Constraints include small farm size, risks related to adoption and the use of livestock for multiple functions (food, traction, ploughing, manure, insurance/banking, culture), which acts as a barrier to the reduction of herd size. Overall, according to Descheemaeker et al. (2016), spatial and institutional factors that are beyond farmers' control, including small and decreasing farm sizes, limited access to inputs, insecure land tenure, high investment risks and market dysfunctions, present major barriers to adoption. Overcoming these barriers requires transformative change that includes risk-transfer mechanisms, capacity building and incentivising farm investment, for instance through tenure security, value chain and market development or credit schemes.

5. Understanding the characteristics of resilience in 2016 Q4 literature

As the preceding sections show, multiple disciplines and domains of practice employ resilience thinking. This section interprets the literature discussed in the grey and academic literature in the last quarter of 2016 through the five broad characteristics of resilient systems identified by The Rockefeller Foundation.

5.1. Awareness

Awareness is the ability to constantly assess, learn and take in new information on strengths, weaknesses and other factors through sensing, information-gathering and robust feedback loops.

Key messages

- Measuring resilience requires a mixed method approach that is tangible to both those at risk and outside stakeholders; analysis must capture resilience as a process and an outcome.
- It is essential to understand the context and wider system within which people and organisations live, which can affect how resilient they are to climate extremes and disasters.
- ICT can support disaster assessment and monitoring, as well as response efforts, using big data and participatory mechanisms of data collection and analysis.
- M&E of resilience processes needs to pay close attention to contexts and local embeddedness of the approach.

Awareness of the context and wider systems that can have an impact on people's resilience is a strong focus within the grey literature, as is an assessment of the causal links between contributing factors. For instance, Sterrett (2016) assesses the context in which people live, highlighting the links between poverty, rights, power,

inequality and vulnerability. Similarly, Bahadur et al. (2016) argue for the need for a better understanding of the natural and physical exposure, and social and economic vulnerability, of people and assets to climate change to inform urban climate change resilience actions. Meanwhile, Carabine et al. (2016) consider how shifting institutional and governance arrangements have an impact on how households and communities access financial services.

The grey literature also challenges some assumptions around resilience. Reed and Friend (2016) challenge the term 'community resilience', and stress that its ambiguity can result in negative impacts, such as the rolling back of core social entitlements. Similarly, Hallegatte et al. (2016) challenge the measurement of the impact of 'natural' disasters by traditional estimates based on economic losses, which the paper claims fail to account for impacts on well-being, and therefore can lead to the neglect of the poorest and most vulnerable in society.

Much like previous Resilience Scans, there is a focus within the grey literature on different tools and methodologies for measuring resilience. Ospina and Heeks' (2016) resilience tool features both qualitative and quantitative methods to assess development projects before, during and after implementation. Similarly, IFRC (2016) identifies three main approaches to measurement: (1) resilience as an attribute/a reflection of losses, (2) resilience as a process, and (3) resilience in the eyes of those facing hazards. Meanwhile, Audia et al. (2016) investigate resilience at the local, organisational and institutional levels, using qualitative methodologies to improve understanding of how institutional context shapes, and is shaped by, the behaviour of the actors involved.

M&E, along with measurements of resilience and recovery, represent another key concern in the academic literature. In reviewing existing approaches to resilience M&E, Brown et al. (2016) highlight the importance of

taking contexts and local embeddedness into account. Meanwhile, Platt et al. (2016) present a comparative assessment of different methods to measure recovery, indicating that a combination of direct observation, social audit and published material can enhance an understanding of recovery trajectories. At the same time, the paper cautions, recovery and approaches to 'building back better' need to be viewed in a broader normative context of development interests and personal preferences. Upton et al. (2016) outline a range of key challenges that have hampered standard food security assessments, including political barriers, inconsistent data and high sampling costs. To address these constraints, the paper makes a case for using recent advances in 'development resilience' thinking and modelling to inform and enhance food security measurements.

The academic literature on awareness discusses the role of ICT in generating and using disaster-related knowledge. According to Liu et al. (2016), residents can be active participants in monitoring hazards such as landslides. This presents opportunities for local populations to learn about potential disasters, as well as to generate data that inform early warning and emergency response. The paper assesses how people behave in response to early warning messages before a disaster event and present an innovative methodology that builds on spatially referenced mobile data to improve the cost effectiveness and speed of disaster impact assessments and monitoring. Givoni (2016), in contrast, addresses the topic from a more critical perspective. The paper argues that ICT tends to provide new tools for ensuring security and order in crises, and deepens existing tensions within the humanitarian sector by trying to combine the dual purpose of witnessing and resilience.

5.2. Diversity

Diversity implies that a person or system has a surplus capacity that allows it to operate successfully under a diverse set of circumstances, beyond what is needed for everyday functioning or relying on only one element for a given purpose.

Key messages

- Diversification is a successful adaptation strategy to help build resilience against a range of unpredictable, intensifying and changing risks.
- Diversity in financial instruments and investments will help build the resilience of vulnerable systems, places and organisations that are at risk from a range of shocks and stresses.
- Flexible mechanisms for obtaining different types of seeds from various sources can help farmers diversify their production and cope with stresses.



There is a focus within the grey literature on the diversification of livelihoods, tools and strategies to build resilience to changing risks. For instance, Aslihan et al. (2016) present diversification as an adaptation strategy and as a means of building resilience to unpredictable rainfall in Zambia. Likewise, an IIED briefing paper (Swiderska et al., 2016) on achieving SDG2 (end hunger and achieve food security) highlights the importance of genetic diversity in reducing risks in agricultural systems. Meanwhile, Wilkinson et al. (2016) highlight the need for the diversification of livelihoods to help reduce displacement and forced migration, which will in turn reduce risk accumulation in both rural and urban areas. Diversity in financial instruments and investments was also highlighted. The OECD/World Bank report (2016) advocates investing in national capacities, expertise and financial instruments to help SIDS improve their debt situation. Similarly, Brahmabhatt et al. (2016) specify the importance of rapid economic transformation and growth supported by targeted public investments and adaptation programmes in building climate resilience, including diversification into manufacturing and other high-productivity modern sectors.

The grey literature also considers the diversity of needs, capacities and perspectives in building resilience. Bahadur et al. (2016) note that urban resilience needs to be considered in the context of complexity, taking into account the diverse range of spatial, temporal and sector relationships which exist. Meanwhile, Pionetti (2016) highlights the need for sex-disaggregated data

and gender-responsive budgeting to successfully consider different needs and perspectives within programming.

Diversity features less prominently in this Resilience Scan's academic literature than in the previous quarter. Three articles focus on diversifying livelihoods and agricultural practices. Kansime and Mastenbroek (2016) demonstrate how farmers use different varieties and sources of seed to satisfy various production criteria, including marketability, yield and climate adaptability. In addition, a shift between seed sources in times of stress indicates the flexibility of seed systems and the importance of diversification as a production strategy and a coping mechanism. Watete et al. (2016) find that pastoral households in Kenya's most northerly Turkana and Mandera regions strengthen coping mechanisms through diversification into agricultural and off-farm activities. The authors highlight the role of education and access to water in providing more options for diversification. Similarly, Hussain et al. (2016) show how residents of river sub-basins in the Hindu-Kush Himalayan region use livelihood diversification, changing farming techniques and migration as strategies to enhance their resilience in the face of increasing disaster frequency.

5.3. Self-regulation

This implies that a system can deal with anomalous situations and interferences without significant malfunction, collapse or cascading disruption. This is sometimes called 'islanding' or 'de-networking' – a kind of 'safe failure' that ensures any failure is discrete and contained.

Key messages

- Decentralisation and a reduced reliance on value/supply chains will help protect against cascading disruption and system failure.
- Globalisation has led to increased global risks that can have cascading impacts across regions.
- Collaboration and agreements between fisheries help communities to cope and recover.
- Resilience defined as bouncing back to the previous state may not be desirable; when systems produce inefficient and unsustainable outcomes, it can be beneficial to break their resilience.

Decentralisation and a reduced reliance on value/supply chains are highlighted by three publications within the grey literature. OECD/World Bank (2016) emphasises the need for urban resilience to combat the increasing reliance on global supply chains. The authors note that because of globalisation, risk itself has become globalised, and therefore if a disaster occurs in one city, it can have cascading impacts on multiple cities around the world. On

It can be desirable to break, instead of strengthen, the resilience of urban systems when resilience is geared towards reverting to the previous institutional systems if those systems are inefficient and unsustainable

a more localised scale, Dekens and Dazé (2016) discuss the importance of climate risk management within value chains through the example of a small domestic seed distribution company in Uganda. They stress the benefits of climate-resilient seeds. The briefing note also highlights the need to strengthen broader systems that support value chain development such as infrastructure. Tayal and Singh (2016) advocate the decentralisation of the market and waste to energy systems in urban India to reduce resource consumption and waste.

Two of the academic articles focus on fisheries' self-regulation as a component of resilience. In the Solomon Islands, Hardy et al. (2016) find that *wantoks* – collaborative fishery structures – strengthen the resilience of fishery systems as compared to a scenario without such collaboration. In addition to preventing system collapse, *wantoks* support a return to the initial state before a shock, maintain community subsistence and food security, and present a mechanism for adopting fishing strategies that allow communities to recover. Ojea et al. (2016) show that details of regulatory design and management contribute to variations in resilience outcomes. The paper concludes that rights-based approaches generally seem to contribute to a larger variety of resilience dimensions than open access regimes. As regards community resilience on a broader scale, the conceptualisation of resilience as suggested by Kais and Islam (2016) underscores the central importance of community capitals in grappling with climate change and strengthening resilience. Following the framework, the extent to which a community withstands and bounces back from climate shocks depends, in essence, on how it utilises its resources. Puppim de Oliveira (2016) presents a contrasting view in arguing that it can be desirable to break, instead of strengthen, the resilience of urban systems when resilience is geared towards reverting to the previous institutional systems if those systems are inefficient and unsustainable. Resilience should instead be focused on change that supports resource efficiency and sustainable development.

5.4. Integration

Being integrated means individuals, groups, organisations and other entities have the ability to bring together disparate thoughts and elements into cohesive solutions and actions. Again, this requires the presence of feedback loops.

Key messages

- Integration is key to achieving coherence and alignment between the post-2015 frameworks on climate, disasters and development.
- Breaking down silos between different organisations and ministries, and fostering stronger partnerships, is key for successful integration across sectors and disciplines.
- Stakeholder participation, integration of different knowledge types and consideration of local context can support resilience initiatives.
- Integrated approaches to building assets can support the agency of the extreme poor and thus strengthen their resilience in an effective and sustainable way.

Integration is highlighted in the grey literature through partnerships, sectors and systems. In terms of stronger partnerships, Carabine et al. (2016) demonstrate the need for greater integration between national scientific institutions, that are often responsible for providing climate services, and local informal institutions that can more easily disseminate the information. Gupta et al.'s (2016b) training manual for state-level actors in India promotes an integrated approach to CCA, DRR and development planning, which requires integration and partnerships between actors, across sectors. Integration is also a core theme for coherence and alignment between the post-2015 frameworks on climate, disasters and development. The World Economic Survey 2016 highlights the importance of strengthened global partnerships and asserts that the post-2015 frameworks provide a unique opportunity to solidify global cooperation in support of regional and national efforts towards achieving sustainable and climate-resilient development (UNDESA, 2016). FAO/UNISDR (2016) underlines the need for firm political commitment and leadership for the implementation of the Sendai Framework in the FSA and FSN sectors. Integration and partnerships within at-risk groups are also highlighted. Plan International and ARUP (2016) advocate the enhanced inclusion of children and youth within urban governance systems, municipal budgets and urban development plans, while Gnisci (2016) highlights the need for investment in women's financial and social capital in West Africa to support their integration into distribution networks. Finally, CARE (2016) stresses the need for enhanced financial inclusion in conflict and fragile affected states, as only 15% of adults in these contexts have an account with a formal financial institution.

The need for integration between sectors is a strong theme in the grey literature in terms of policy and development planning. ADB (2016) advocates the mainstreaming of green infrastructure and nature-based solutions into town development and planning, particularly for small and medium-sized cities and towns. Tayal and Singh (2016) highlight the need for integration between the food, water and energy sectors alongside a more comprehensive integration of watershed and food management within city-level planning. Meanwhile, CISL (2016) takes a different approach and advocates the integration of resilience into investment portfolios, arguing that this could provide substantial benefits not only for societal resilience but also for the insurers themselves. Finally, Wilkinson et al. (2016) highlight the need for climate-induced migration and displacement trends and projections to be integrated within and among DRR and adaptation programming.

A focus in the academic literature is the integration of different sources of knowledge and streams of thinking in conceptualising and measuring resilience. Ideally, planning support tools assist the exchange of knowledge and facilitate collaboration between different stakeholders in planning processes (van de Ven et al., 2016). Borquez et al. (2017) indicate that the consideration of different ethical and knowledge dimensions and effective facilitation throughout the design phase contribute to the success of participatory knowledge co-production, whereas power relations, normative contexts and issues around differing or shared understanding can present challenges. Doughty (2016) highlights that local embeddedness and community participation are crucial to conservation and resilience initiatives. At the same time, local organisations may be less inclined to challenge established power structures, which can limit their impacts on empowerment.

The resilience concept in itself can act as a driver or platform for integration. Keating et al. (2017) make a case for establishing links between disasters and multidimensional development to generate a more holistic understanding of DRM. In addition, Atallah (2016) argues for a greater integration of social, political and historical complexities with considerations of natural disasters in resilience and DRR thinking. In assessing the role of insurance on reducing economic losses from disasters, Breckner et al. (2016) find that the mitigating effect of private market insurance is enhanced when it interacts with open and stable institutions. The interconnectedness of social-ecological processes is a further focus in the academic literature.

The resilience concept in itself can act as a driver or platform for integration

For example, Li et al. (2016b) argue for the need to balance environmental protection and economic concerns around land use to support the adaptive capacity of water systems and maintain water quality. Descheemaeker et al. (2016) claim that mixed farming systems and their potential for adaptation to, and mitigation of, climate change are often poorly understood. To address this shortcoming, the paper suggests an integrated systems approach that considers farm processes and components at various scales. Finally, Hossain and Rahman (2016) highlight the importance of strengthening diverse assets and the need to address their interconnectedness. The authors describe how integrated approaches can support assets and agency of the extreme poor to strengthen their resilience effectively and sustainably.

5.5. Adaptiveness

Adaptiveness is the capacity to adjust to changing circumstances during a disruption by developing new plans, taking new actions or modifying behaviours to better withstand and recover from them, particularly when it is not possible or wise to go back to the way things were before. It also suggests flexibility and the ability to apply existing resources to new purposes, or for one thing to take on multiple roles.

Key messages

- To support the most marginalised, interventions must be flexible and adaptive to learn how best to support those who have experienced persistent exclusion and inequality.
- To enhance learning, resilience-building initiatives must take advantage of new technologies and communication platforms, and the availability of real-time and accurate information.
- Transformation is crucial to overcoming structural inequalities and marginalisation that limit the resilience of vulnerable populations against climate hazards.
- Adapting agricultural and pastoralist activities towards drought-resistant and CSA practices can increase resilience and generate co-benefits such as empowerment.

Adaptation and adaptive capacity are highlighted within two grey literature publications in relation to food security and agro-ecosystems. Van Bers et al. (2016) look at transformation in governance and structural changes to support climate resilience in food systems. At a more local level, Morris et al. (2016) consider adaptive measures in coffee agro-ecosystems for smallholder coffee growers in Central America. The paper highlights the role that shade trees can play in building the climate resilience of

The largest share of this quarter's academic literature revolves around adaptiveness, with four of the articles assessing adaptive practices in agriculture, forestry and pastoralism

coffee plants against temperature spikes and in regulating microclimatic temperatures. Other publications in the grey literature include adaptation within their frameworks or recommendations for change. For instance, Knopman and Lempert (2016) include the capacity to adapt and transform as a supporting indicator within their urban resilience framework. Pedrajas and Choritz's (2016) 'Last mile action agenda' highlights the need for LDCs and their partners to tailor their interventions to the unique 'last mile' environments in which they operate, stressing that these interventions must be flexible and adaptive to support those most in need. Moreover, they highlight that interventions must be accompanied by patience, multi-year approaches and real-time learning to effect lasting change. Pionetti (2016) highlights the need for greater equality, and emphasises that, if female adaptive capacity is enhanced, the overall capacity of a family or a community can also be enhanced. Finally, Gupta et al. (2016a) highlight how traditional methods of DRM must adapt to new advancements in communication technologies to support resilience.

The BRACED programme features in a number of the publications that consider characteristics of adaptiveness. For instance, Singh et al. (2016) draw on multiple case studies from the 2015–2016 drought in Ethiopia to highlight the need for flexible funding and adaptive programming for humanitarian and development organisations implementing projects in drought contexts. Meanwhile, Ulrichs and Slater (2016) argue for the need for a better understanding of the contribution of social protection to adaptive capacity. Finally, Villanueva et al. (2016) provide insights from year one of the BRACED programme, which demonstrated some initial challenges in achieving or facilitating adaptive capacities across the different consortia working in the programme. The report notes that communities tend to focus more on building anticipatory and absorptive resilience capacities than on adaptive capacities, due in part to the challenges of identifying and adapting to long-term climate change coupled with the relatively short three-year BRACED timeframe.

The largest share of this quarter's academic literature revolves around adaptiveness, with four of the articles assessing adaptive practices in agriculture, forestry and pastoralism. Ryan and Elsner (2016), for instance, show

how small-scale adaptive interventions, such as sand dams, can be an effective way to enhance water provision and strengthen resilience. Meanwhile, Watson et al. (2016) describe the increasing change from cattle- to camel-raising among pastoralists in Northern Kenya. The animals' drought resistance and profitability support pastoralist adaptation to environmental shocks and stresses. Bone (2016) discusses the connections between forest dynamics and policy-making. Framing forest management as complex adaptive systems can, according to the paper, help to understand the impacts of forest policies and identify adaptation measures. Focusing on gender dimensions, Khapung (2016) describes the potential empowerment benefits that CSA initiatives can create for women beyond core CSA impacts through training and leadership.

Several academic articles refer to the potential for change and transformation through adaptiveness. In this context, Archer (2016) highlights the transformative potential of adaptation – achieved through co-benefits of poverty reduction and development initiatives – that questions existing power structures and reduces inequalities.

Tumini et al. (2016) describe how the experience of a disaster can lead to higher levels of urban resilience when reconstruction policies and planning focus on cross-sectoral participatory approaches and manage to 'build back better'. Similarly, Choudhury and Haque (2016) regard adaptive capacity as a prerequisite for resilience and a facilitator for transformation in socioeconomic systems. In assessing household resilience to conservation policy interventions, Li et al. (2016a) measure objective resilience as a composite of adaptive strategies that aim to build resilience. Romero-Lankao et al. (2016) find that diverse levels of capacities and wealth influence household vulnerability to climate hazards in Mumbai. Based on this, the authors argue for support for capacity-building approaches and the need for transformation of institutions and power relations to address structural inequalities and marginalisation. Finally, Farley and Voinov (2016) discuss social-ecological processes and strategies that need to adapt to adjust to human- and nature-induced change. These include predominant growth-focused economic systems that push ecological and economic boundaries defined by inequality and a finite planet.



Pedestrian waits to cross, Mumbai. Photo credit: Simon D McCourtie/World Bank, 2009. CC BY-ND 2.0.

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Annex: Blog visibility methodology

Measuring visibility

The purpose of this initial step is to offer a bird's-eye view of the resilience blogosphere. Using blog search engines, Boolean search queries were performed to identify blogs that publish about resilience in different contexts. This initial exploratory search identified the top 50 resilience blogs, with the criterion being how visible the relevant blog content is on the web. This ranking was derived by a score based on Google PageRank, Page Authority, Domain Authority.

The next step involved narrowing down the list to the top 25 resilience blogs. With the initial list ranked by search engine visibility and content relevance, the 50-blog list was manually reviewed to exclude blogs that:

- have low keyword/subject matter relevance.
- are link farms and blog aggregators, which do not publish original content or syndicate posts from other blogs.
- have no active comment sections or measurable social sharing features.
- posted no relevant updates in 2016.

Who published the most popular blog posts on resilience in 2016?

Measuring impact

A complete manual review and analysis of resiliencerelated blog posts published in the first half of 2016 was performed, and the top 25 blog posts were identified based on metrics of social shares and comments/reader engagement. A score was derived by aggregating the following metrics:

- blog comments
- Facebook shares
- Facebook 'likes'
- Facebook comments
- Twitter shares
- LinkedIn shares

The list was then ranked by aggregate impact score to present the top 25 resilience blog posts.



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