



Resilience
Development
Initiative

Measurement and evidence: whose resilience for whom?

JC Gaillard

The University of Auckland, New Zealand

Rohit Jigyasu

*Indian Institute for Human Settlements,
India*

Working Paper Series
No. 11 | November 2016

© Resilience Development Initiative

WP No : 11
Date : November, 2016



Resilience Development Initiative (RDI) is a global think tank initiative based in Bandung, Indonesia that focuses on environmental change and sustainable development. RDI contributes to the body of knowledge on development and disaster research studies in Indonesia and South East Asian Region.

RDI Working Paper Series is published electronically by RDI.

The views expressed in each working paper are those of the author or authors of the paper. They do not necessarily represent the views of RDI or its editorial committee.

Citation of this electronic publication should be made in Harvard System of Referencing.

Editorial Team:

Elisabeth Rianawati

Dr. Saut Sagala

Adam Scott Reeves

Contact:

Address: Jalan Imperial II No. 52, Bandung 40135

Jawa Barat – INDONESIA

Phone: +62 22 2536574

Email: rdi@rdi.or.id

Website: www.rdi.or.id

Measurement and evidence: whose resilience for whom?¹

JC Gaillard¹ and Rohit Jigyasu²

¹ *The University of Auckland, New Zealand*

² *Indian Institute for Human Settlements, India*

1. Introduction

Over the past couple of decades, the concept of resilience has been gaining growing attention in academic and policy discourses as well as within circles of practitioners (e.g. Manyena, 2006; Alexander, 2013; Weichselgartner and Kelman, 2015). The concept has indeed been picked up by researchers, international organizations, Non-Government Organizations (NGOs), funding agencies and private firms so that it has become one of the main buzzwords in the fields of development, disaster risk reduction (DRR) and climate change adaptation.

Although resilience has a very long history (Alexander, 2013), it was brought to popularity by Holling's paper on the resilience of ecological systems wherein the term was defined as an environmental and ecological ability to absorb a temporary disturbance and then reorganize itself totally into its pre-existing state or to a new, recovered state (Holling, 1973). The concept was then quickly picked up by the disaster literature (Torry, 1979a), mirroring other early use in child psychology (Werner et al., 1971) and engineering (Gordon, 1978). It is nowadays the object of a conceptual debate, especially among social sciences (Manyena, 2006; Alexander, 2013). In line with Holling's ecological approach, resilience is often viewed in the long term, based on a society's evolution and ability to overcome shocks and disturbances (Folke et. al., 2002). A second set of definitions and approaches look at resilience in a narrower perspective that is the flip, positive side of vulnerability or the ability to resist damage and change in facing natural hazards (Mileti, 1999). Pelling (2003) rather considers resilience as a component of vulnerability or the ability of an actor to cope with or adapt to hazards, including through planned preparation and spontaneous or premeditated adjustments. A fourth stream of definitions place resilience in a post-disaster context to capture the ability of a system or people to recover from hazardous events (Timmermann, 1981; United Nations International Strategy for Disaster Reduction, 2002).

Notwithstanding such loose conceptual framing, strengthening resilience has become the priority of most, if not all agendas for DRR at all scales, from the Sendai Framework for Disaster Risk Reduction (SFDRR) and international funding agencies' priorities, to national policies and practitioners' everyday initiatives. In consequence, international, governmental and non-governmental institutions have progressively felt the need for measuring resilience in order to: 1/ prioritise policies and actions, 2/ monitor progress and 3/ foster accountability (Béné, 2013; Levine, 2014). This demand for evidence and measurement has stimulated an incredible flurry of approaches, methods and tools designed by researchers as well as international organizations and NGOs, to capture the multiple dimensions of resilience at a variety of scales. The following sections provide a non-exhaustive but hopefully representative overview of these approaches, methods and tools, framed within the different paradigms that have guided disaster studies and DRR over the past century. Noteworthy, though, is that the subsequent review and discussion purposefully exclude the specific and very large field of resilience measurement in psychology for which there are multiple reviews already available (e.g. Norris et al., 2008; Windle et al. 2011).

¹ A shorter and revised version of this paper appears as chapter 2 of the World Disaster Report 2016 published by the International Federation of Red Cross and Red Crescent Societies: <http://media.ifrc.org/ifrc/publications/world-disasters-report-2016/>

2. What kind of evidence for what kind of measurement?

The diverse approaches for measuring resilience to natural and other hazards reflect a different ethos that are grounded in divergent, often opposing, epistemologies. Each mirrors fundamentally different understandings of disaster and therefore underpins diverse sets of policies and practices to reducing disaster risk. The three streams of methods identified by Chambers (2007a) in the context of poverty assessment provide a useful framework for comprehending the different ways resilience is approached. These three streams are 1/ economic reductionism, 2/ anthropological particularism, and 3/ participatory pluralism.

2.1. Economic reductionism and the hazard paradigm

Economic reductionism refers to quantitative and non-contextual methods grounded in a positivist view of the world and of disaster risk. The quest for quantification and measurements reflects the long-standing and dominant hazard paradigm and the overwhelming influence of Western science and knowledge in DRR (Hewitt, 1983, 1995). Western science is often considered as the solution to better understanding and addressing why some places, in the West, are allegedly less affected than others, in the rest of the world, by disasters, especially large events (Bankoff, 2001).

Fuelled by Western science, the hazard paradigm assumes that disasters result from the occurrence of extreme and rare natural hazards that exceed people's ability to cope (Gaillard, 2010). Physical sciences, including seismology, volcanology, hydrology, climatology, etc, have therefore had a predominant role in calculating, through diverse methods, the probability of occurrence and magnitude of hazards. Parallel to this, the assessment of resilience has focused on how people and societies perceive the potential danger and how they adjust to possible threats (Burton et al., 1978). Factors that affect people's resilience are hazard-related (i.e. the recentness, frequency and intensity of personal experiences with such hazards) and/or often considered from a taxonomic and quantitative perspective in direct relation to hazards, though the use of related concepts such as 'exposure' (to natural hazards) and indicators and/or proxies like demographic data.

Methods to assess resilience are, as a consequence, quantitative and lead to computing scores, ranks and indexes. These reductionist methods are driven by outside experts who design questionnaires and other extractive tools based on their generalized assumptions of what resilience is and means. Local people who face hazards and disasters are thereby passive respondents of surveys and other censuses. Surveys to assess resilience are conducted in different regions of the world following similar approaches so that the outcomes are comparable (White, 1974). These allow for the design of universal theoretical frameworks such as the choice tree of adjustment to natural hazards, which has been applied from individual to societal levels (Burton et al., 1978).

This reductionist approach to assessing both hazards and resilience has underpinned top-down transfers of knowledge, technology and experience from the wealthiest and most powerful regions of the world, supposed to be safer because of their larger technological and economic resources, towards the poorest and less powerful ones, considered more vulnerable and unable to cope alone (Bankoff, 2001). DRR has therefore long predominantly been a technocratic process based on the judgement of experts, who most often do not face hazards and disasters themselves. It entails command-and-control initiatives meant to be for the good of those at risk who are deemed unable to make informed judgements as they lack command of the numbers at stake (Gaillard, 2010). These initiatives include building infrastructure to prevent hazards and an arsenal of actions geared towards better controlling those at risk by providing them with scientific information to raise their awareness of natural hazards and 'managing' their response to such events should they occur.

2.2 Anthropological particularism and the vulnerability paradigm

Anthropological pluralism draws upon qualitative methods geared toward providing contextual and rich descriptions of local realities. These have long been used in disaster studies to examine people's response to disaster and more recently to assess their resilience to natural and other hazards. Driven by postmodernist or Marxist, as well as Senian epistemologies, anthropologists and geographers, in particular, have provided multiple and detailed qualitative accounts of people's resilience that have deconstructed or challenged the importance of natural hazards in explaining the occurrence of disasters and their impact (O'Keefe et al., 1976; Hewitt, 1983; Torry, 1979b; Oliver-Smith, 1996). Resilience to natural hazards is here viewed through the lens of the concept of vulnerability.

Vulnerability mirrors people's inability to access resources and means of protection that are available to those with more power (Wisner et al., 2004). People affected by disasters are indeed disproportionately drawn from the margins of society and can include, depending on the context, children, elderly, people with disabilities, women, gender and ethnic minorities, etc (Wisner, 1993; Wisner et al., 2012). Vulnerability thus reflects how power and wealth are shared within society and traces its roots to cultural, social, economic and political structures, which lie beyond the reach of those who are vulnerable (Gaillard, 2010). People's vulnerability to natural hazards is context-specific and varies in time and space. It also mirrors the nature, strength and diversity of their everyday livelihoods.

Understanding people's resilience to natural hazards through the lens of their vulnerability therefore requires fine-grained studies relying upon qualitative, often ethnographic research methods to better elicit the unique realities of people's everyday life. These include tools such as semi-structured interviews, life stories, participant observations and focus groups designed to foster interaction between outside researchers/practitioners and local people. The outcomes of such studies are qualitative and hardly comparable from one place to another. However, some powerful frameworks have been designed to confront them. The most influential of these is the Pressure And Release (PAR) framework popularized by Wisner et al. (2004). The PAR tracks the factors of vulnerability from the unsafe everyday lives of those at risk to dynamic pressures and, ultimately, structural root causes.

Anthropological pluralism and the vulnerability paradigm have led to challenging the dominant technocratic approach to DRR. They have gained much ground over the past two decades although their direct translation into policy and practice has been relatively limited (Gaillard, 2010). In this perspective, enhancing people's resilience can only result from addressing the root causes of people's vulnerability. Because these are largely exogenous to those at risk, strengthening resilience requires the intervention of those with power in order to grant access to resources to those vulnerable as well as strengthening their everyday livelihoods. This depends upon a radical shift in current policy and practice that warrants strong political will (Wisner et al., 2012).

2.3 Participatory pluralism and the capacities paradigm

Participatory pluralism refers to approaches geared towards fostering the participation of people at risk, in their diversity, in assessing their own resilience. It draws upon the assumption that those at risk, although often marginalized, still display capacities in facing natural and other hazards. These capacities include the unique set of diverse knowledge, skills and resources that people can claim and access when dealing with hazards and disasters (Anderson and Woodrow, 1989; Wisner et al., 2012).

The emergence of the concept of capacities in the late 1980s was strongly influenced by the growing momentum gained by the postcolonial idea that people, including the most marginalized, should be at the forefront of development. This holds true in DRR in particular, because those people affected are often knowledgeable and resourceful (Freire, 1970; Chambers, 1983). Capacities in facing hazards and disasters have provided the rationale for fostering people's participation in DRR. Recognizing that people have capacities indeed underpins this approach. As many Red Cross and Red Crescent societies put it in their manuals, when people participate in enhancing their own resilience they "have more control over shaping their own futures" (e.g. Vietnam Red Cross Society, 2000: 6). This

suggests a shift in power relations away from external institutions and organizations.

Participatory approaches for assessing resilience to natural hazards have gained significant traction amongst practitioners. These are nowadays gathered under the umbrella of Participatory Learning and Action (PLA). PLA refers to methods and attitudes designed to empower those at risk to share, analyse and enhance their knowledge of disaster risk as well as plan, implement, monitor, assess and reflect in their efforts towards DRR (Chambers, 2007). The emphasis on attitudes and behaviour is particularly important here. Indeed, participatory approaches to assessing resilience often put forward unique sets of tools to produce visual data intelligible to all, including those who may not be able to read, count and write. If these tools are important to elicit people's knowledge, they need to be properly facilitated in order to hand over the stick and shift power relations at the benefit of those at risk. To put the last first, to echo R. Chambers' (1983) famous saying, the process through which resilience is assessed is ultimately more important than the sole outcomes of the evaluation.

Participatory pluralism therefore suggests that assessing and enhancing resilience is the prime responsibility of those at risk, who take the lead in designing the most appropriate DRR strategies in the context of their everyday and longer-term priorities. Outside stakeholders, including scientists and government agencies, are only to provide external support to sustain people's initiatives and foster the transfer of experiences across spatial scales (Delica-Willison and Gaillard, 2012). These initiatives are often garnered under the framework of 'community-based DRR' (and cognate expressions) despite the challenging nature of the concept of 'community' (Cannon et al., 2014).

3. Measuring resilience in practice: a brief reviews of methods and tools

The past couple of decades have witnessed the emergence of a flurry of methods and tools to provide evidence and assess resilience in a variety of contexts. These have focused on multiple scales, from the household, organization and 'community' (whose meaning is highly contested) to city/province/region and country levels. This section does not attempt to provide an exhaustive review of all these methods and tools. Rather, it endeavours to illustrate how the three main streams of measurement, discussed in the foregoing section, materialize in practice (Table 1). For those readers interested, more detailed and recent reviews of existing methods and tools are available in both the academic (e.g. Ostadtaghizadeh et al., 2015; Beccari, 2016) and policy literature (e.g. Levine, 2014; Winderl, 2014).

3.1 Economic reductionism: indexes and other quantitative measurements of resilience

A large and diverse set of tools for the quantitative measurement of resilience have been recently developed (e.g. Levine, 2014; Winderl, 2014; Ostadtaghizadeh et al., 2015; Beccari, 2016). These tools draw upon two fundamentally different assumptions, independent of how resilience is actually defined. On one hand, resilience is considered through the lens of past and potential losses and thus mirrors the impact of disasters. On the other hand, resilience is viewed as an attribute of people or places. These two different approaches for apprehending resilience have led to two parallel streams of quantitative assessments. For both streams, data are collected, manipulated and analyzed by outsiders (e.g. researchers, government officials, NGO staff) and, whenever there are interactions with local people, they are passive respondents of an extractive process (Table 1).

Assessing resilience based on losses requires an appropriate and reliable dataset, whatever the scale of the analysis. Data on losses are eventually integrated with a range of social and economic indicators through various equations. Indicators are identified through questionnaire surveys and/or secondary data from census organizations, depending on the scale of analysis. Hallegatte et al.'s (2016) recent attempt at measuring the resilience of Mumbai, and eventually a number of countries to flooding constitutes a good example of such approach. The analysis relies upon an econometric estimation and modeling of consumption and output losses for the whole city of Mumbai then of its inhabitants' assets and incomes/welfare losses in correlation with their social and economic status assessed through various indicators. The resulting model has eventually been calibrated with household surveys conducted in the city and scaled up to 90 countries. For the latter, resilience was calculated as the ratio between expected asset losses and, expected asset losses, and as a result, expected welfare

losses, in the context of exposure to flood hazards and the latter's return period. Ultimately, resilience is compared to the countries' Gross Domestic Product.

Table 1. Characteristics of the three main types of approaches to measuring resilience to natural hazards and disasters (adapted from Chambers, 2007a)

Approach	Economic reductionism	Anthropological particularism	Participatory pluralism
Ethos and principle	Resilience as an attribute / a reflection of losses	Resilience as a process	Resilience in the eyes of those facing natural hazards and disasters
Methods	Quantitative	Qualitative	Participatory
Role of outsiders	Data collector	Participant observer	Facilitator
Role of local people	Respondent	Social actor	Analyst
Mode	Extractive	Interactive	Self-organising
Contribution to knowledge	Comparable numbers and indexes	Social and cultural insights	“Surprises”
Outputs	Tables, graphs, maps	Rich descriptions	Tables, diagrams and charts, maps

Measurements of resilience as an attribute of people or places are conducted at both country and sub-administrative levels, be these neighbourhoods, cities or provinces, and rely on available secondary quantitative indicators and/or questionnaire surveys. Diverse indicators are used as proxies for the multiple dimensions of resilience and compiled into composite indexes. A large number of variables from census and survey data are usually normalized/standardized, then scaled/weighted and aggregated using various equations. For example, Manyunga's (2009) Community Disaster Resilience Index draws upon 75 variables, eventually aggregated in 15 sub-indexes then into the main resilience index at the scale of counties and parishes in the US. Cutter et al. (2010) follow the same process at the same scale using 36 variables compiled into five sub-indexes to form a main Disaster Resilience Index. For both indexes, the results and evidence are ultimately presented as maps of the different counties to visualize their different levels of resilience and to facilitate decision making and prioritization of actions towards strengthening DRR.

Other composite resilience indexes designed to reflect resilience as an attribute combine secondary data with primary information to capture more specific dimensions of resilience and tailor measurements to local contexts. Primary data are usually collected through questionnaire surveys, and these outcomes are eventually translated into numbers. This quantitative data is gathered to capture multiple dimensions of resilience through selected indicators and proxies. For example, the Climate and Disaster Resilience Index (CDRI), designed to assess the resilience of Indian cities, considers 125 indicators divided across five categories, which each include a specific set of multiple variables (Shaw et al., 2010). Data are collected through a couple of questionnaires to be filled by government officials at regional then local levels. The weighted mean of the responses for each category is eventually calculated through a formula and indicators are then combined and graded along a scale of four degrees of resilience. As for the previous set of indexes, the resulting indexes and evidence are presented as maps of the cities to visualize the different degrees of resilience of each neighbourhood.

Finally, there are resilience indexes that rely exclusively (or almost exclusively) on primary data to better reflect the views of local stakeholders. Data are usually collected through interviews, focus groups or, more often, questionnaire surveys to provide quantitative evidence that are eventually standardized and collated through various equations. Béné et al.'s (2016) approach to measuring resilience in Fiji, Vietnam, Sri Lanka and Ghana provides an example of such an approach. Gender-disaggregated focus groups are initially conducted with people of different occupations to elicit a first set of qualitative data used to design a couple of questionnaires focusing on resilience per se and

people's quality of life. The questionnaires provide a set of 34 variables that are eventually aggregated in a model to compute an index of resilience. The results and evidence are presented through tables and graphs crafted to provide explanations for different patterns of resilience.

3.1 Anthropological particularism: qualitative measurement of resilience

There are all sorts of qualitative studies geared towards assessing the resilience of people and places. Most of these emerge from the social sciences and try to explore the deep-seated mechanisms that underpin the process of resilience at different scales. Some are stand-alone studies for the sake of academic research while others are designed to reflect upon the outcomes of a particular project. Some are finally geared to inform policy and practice. The myriad of available studies can be roughly classified in three streams of approaches reflecting how much filtering/analysis is carried out by the researcher. In all three streams, however, the researcher is a participant observer that engages in an interactive relationship with the local people who are social actors (Table 1).

First of the three streams are raw accounts and stories from people at risk or those affected by disasters. These testimonies are usually collected through extractive tools such as interviews that reflect researchers' expectations. However, they are meant to provide vivid evidence of how people feel about resilience. These accounts are highly contextual and can hardly be compared to each other although they are often compiled into books or reports to show the diversity of people's experiences and needs in facing natural hazards and disasters. Ride and Bretherton's (2011) compilation of testimonies from five countries, i.e. Indonesia, Pakistan, Solomon Islands, Kenya and Myanmar, illustrates this approach well. It draws upon a series of academic case studies involving semi-structured interviews conducted in local languages with an average of 11 informants in each country. People's stories of disasters and resilience are eventually reported in a textual format relying on extensive quotations.

The second array of studies involve further involvement on the side of the researcher who often draws upon a more diverse range of ethnographic tools, including interviews/life stories and observations, to collect qualitative evidence of people's resilience in facing natural hazards and disasters. The analysis of this data involves a higher degree of data manipulation though a wide range of codified methods that include, for example, content or discourse analysis. Computer programs are also increasingly used to tease nodes and themes out of the datasets. Hastrup's (2011) and Simpson's (2014) recent accounts of how people have overcome the impact of two disasters in India, the 2004 tsunami in Tamil Nadu and 2001 earthquake in Gujarat, respectively, are excellent examples of this type of assessment of resilience. These studies rely on years of field research that provide temporal grounding. They are narrated in text with a particular attention to certain details in order to provide a fine-grained analysis of the drivers of people's resilience. Such evidence of resilience is also highly contextual and constitutes stand-alone studies that can hardly be directly compared.

However, a third level of qualitative assessment of resilience aims at providing proactive frameworks to anticipate and measure resilience in DRR projects. These frameworks emphasise key and usually broad components of resilience that need to be considered in designing projects and measuring progress. These frameworks do not usually refer to particular tools nor do they require any quantitative measurements of any indicators. For example, Buckle (2006) identifies seven factors that support people's resilience in facing natural hazards and disasters, i.e. knowledge of hazards, shared community values, established social infrastructure, positive social and economic trends, and partnerships, communities of interest, and resources and skills. These factors are provided to guide and prioritise practitioners' initiatives towards strengthening resilience.

3.2 Towards participatory pluralism: toolkits and characteristics of resilience

A new set of assessment tools and methods for assessing resilience have emerged and proliferated over the past decade, encouraging more people's participation in the measurement of what resilience means for them. In fact, it is likely that, nowadays, each and every NGO active in the field of DRR

has its own toolkit for assessing and measuring resilience.

Noteworthy, though, is that probably none of these tools and methods are fully participatory as they 1/ all draw upon pre-defined assumptions and characteristics of what resilience encompasses and 2/ involve some level of data manipulation by outsiders, often staff of NGOs. However, their gathering into relatively loose toolkits, often using a range of participatory tools, provide enough space for local stakeholders to make them fit specific and unique needs. In fact, Twigg (2009: 11) suggests that predefined characteristics of resilience should be customised and modified. The role of outside stakeholders is therefore crucial and should be that of a facilitator supporting local people in collecting and analysing their own data (Table 1).

Twigg's (2009) Characteristics of a Disaster-Resilient Community is probably the most popular approach to measuring resilience that gives enough space for people at risk to express their own views of what resilience means for them. These characteristics cover five thematic areas broken down into 28 components of resilience, then subdivided in 161 characteristics of resilience. These only serve as points of reference or 'signposts' to assist practitioners in identifying context-specific evidence and tangible indicators to measure resilience. These characteristics do not suppose the use of any specific tools, but rather, encourage practitioners to rely upon existing toolkits, including participatory toolkits, such as the Vulnerability and Capacity Analysis approach. In that sense, a genuine participatory process may lead to indicators that can reflect the Characteristics of a Disaster-Resilient Community.

Another significant example of these toolkits is CoBRA (Community Based Resilience Analysis) developed by the United Nations Development Programme (UNDP) to assess resilience at the household level (United Nations Development Programme Drylands Development Centre, 2014). CoBRA draws upon pre-defined characteristics and indicators of resilience designed after the Western set of resources that make up the Sustainable Livelihood Framework, i.e. natural, physical, social, financial and human. However, data are collected through interviews with key informants and focus groups that make use participatory tools and thus provide local people with reasonable opportunities to express their views of what resilience means for them. Nonetheless, the data collected are eventually manipulated and analysed by external stakeholders to guide and prioritise their own activities.

Data collected and analysed through participatory toolkits are usually presented as graphs, diagrams, charts and maps that are accessible to all those who face natural hazards and disasters, including the most vulnerable and marginalised who may struggle to read, count and write (Table 1). The visual dimension of these forms of measurement of resilience is one of their main strengths as it allows to overcome cultural and literacy barriers (Chambers, 2010).

4. Is there a view in between?

All approaches to assessing resilience have their own strengths and shortcomings (Table 2). The reductionist approach to quantifying resilience is relatively quick to set up and provide tangible evidence that allow for comparisons across places. They therefore facilitate decision making and prioritisation in policy. Over time, policy makers and practitioners have in fact become number-savvy to the point that decision making has often become a matter of juggling with figures and statistics. Numbers and figures further speak to donors and upper government agencies who call for upward accountability from their funding beneficiaries. Yet, quantitative evidence and measurements of resilience often fail to capture the reality of those at risk whose experiences differ from one household and one place to another. They are also often biased by choices made by outsiders that include focusing on easily accessible places at favourable times of the year. For this reason, they have been called 'quick-and-dirty' by Chambers (1984). Quantitative measurements also require large and varied datasets, which may not be available in the first place or which reliability and validity may be questionable.

Still, reductionist approaches to assessing resilience are the most common nowadays, not only amongst scholars of disaster studies but also in circles of practitioners. This reflects the importance of

upward accountability in the practice of DRR. Many practitioners, be they the staff of NGOs or local government officials, indeed often feel an obligation to report tangible outcomes of their activities to donors and upper agencies. It is therefore appealing to many to quantify increased resilience following a project as numbers and figures are often believed to provide the absolute truth in opposition to qualitative evidence. This obligation for upward accountability is deeply entrenched in international donors' and national governments' obsession with accountancy that is associated with a wide range of conditions placed upon the project: its time frame, the role of the different stakeholders, etc.

Table 2. Main strengths and limitations of the three main types of approaches to measuring resilience to natural hazards and disasters

Approach	Strengths	Limitations
Economic reductionism	- Quick to set up - Comparable numbers	- High level of generalisation - Biased by outsiders' choices
Anthropological particularism	- Contextual details - Long-term processes	- Time consuming - Hardly comparable
Participatory pluralism	- Reflects people's own and diverse views - Addresses actual local needs	- Highly dependent on facilitators' skills - Hardly comparable

Qualitative methods for assessing resilience provide fine-grained views of people's realities and contribute to capturing less tangible aspects of their ability to face natural hazards and disasters. They prove particularly strong to explore causalities, including for understanding why people are resilient or not through the complex interaction of drivers at different time and spatial scales. On the other hand, anthropological particularism has been criticised for being long-and-dirty, in the sense that it requires long studies that when finalised are often outdated or remain on the shelves of academic libraries, and hence are of little use for policy and practice (Chambers, 1984). They also prove difficult to reproduce in space and time, which constitutes another impediment to their inclusion in policy at national and international levels. Ultimately, the use of qualitative methods for assessing resilience has largely been limited to academic research and has had little impact on policy and practice.

In contrast, participatory pluralism has spread broadly within circles of practitioners. Participatory approaches draw upon people's knowledge and skills and foster the participation of those at risk in both assessing and strengthening resilience. They further reflect the diversity of people's realities and emphasise downward accountability towards those at risk. Participatory methods are easy to set up and flexible but require facilitation skills and experience to encourage genuine participation and transfer of power. Often, though, the process is facipulated and skewed to serve the interests of outside stakeholders who need to justify the 'involvement' of locals in activities they have designed beforehand with a typical upward-accountability approach (Cooke and Kothari, 2001). Furthermore, participatory approaches to measuring resilience are frequently distrusted by policy makers who struggle to make sense of such highly context-specific evidence. In addition, participatory assessments of resilience are often disconnected from formal, government and scientific, initiatives.

Ultimately, the foregoing review of approaches for assessing resilience depicts a fragmented landscape where the three different methodologies for assessing resilience operate in silos. This is unsurprising as all reflect diverging, if not opposing, ideologies underpinning not only the assessment of resilience but broader strategies to reduce the risk of disaster. In this sense, there remains a gap that proves detrimental to policy and practice.

It is indeed widely acknowledged that DRR, including the assessment and strengthening of resilience, should integrate a diverse set of knowledge and actions, including those from people at risk and support from outsiders (e.g. NGOs, scientists and government agencies) (Gaillard and Mercer, 2013). This is essential to consider both the root causes of people's vulnerability, driven by exogenous and structural forces, and enhance their capacities that reflect endogenous resources, skills and knowledge. Such integrated approach requires that this gap be bridged through stakeholder dialogue to establish

trust and collaboration. In consequence, quantitative, qualitative and participatory approaches to assessing resilience should be pulled together and reconciled.

Bridging that gap is a difficult task as it entails overcoming deep-seated challenges. The most prominent of them when it comes to assessing resilience is to identify tools that allow all stakeholders to collaborate in the same activities, around the same tables and at the same times. These tools must be trusted by all actors and make people's view of their own resilience tangible to outsiders. They should facilitate comparisons across people, households and places in order to prioritise and inform policy decisions. Such tools also need to be integrated into broader disaster risk assessment and reduction frameworks which consider both the root causes of vulnerability and people's capacities. This allows for the integration of a diverse set of actions, including those from the bottom up and those from the top down.

Tools to bridge the gap between quantitative and qualitative as well as participatory assessments of resilience may already exist. These include quantitative participatory methods (QPM) to generate what is known as participatory numbers (Chambers, 2003, 2007b) or participatory statistics (Holland, 2013). Participatory numbers are "quantitative research information produced by those at the forefront of everyday development struggles, i.e. the poor and marginalised who are usually excluded from mainstream research initiatives supposed to assist in lifting their wellbeing" (Gaillard et al., 2016). QPMs allow for the attribution of 'value' to the qualitative and often intangible dimensions of people's resilience in facing natural hazards and disasters. They draw upon a participatory process where local people define their own indicators and then analyse and monitor them themselves. Participatory numbers produced are thus more likely to reflect people's realities while providing some tangible evidence for comparison and scaling up to inform decision making beyond the place where numbers are produced. Such indicators can be represented in different ways; their visual strength compared to the use of words and text further enables the data to transcend language, cultural and literacy barriers (Chambers 2010). As a result, QPMs facilitate the participation of those generally excluded from research and projects designed to assist them in strengthening their resilience.

5. Can resilience be understood?

In 1998, in a landmark article, Mihir Bhatt asked whether vulnerability could be understood. Two decades later, the same question applies to resilience: can resilience be understood and measured? In fact, one may actually ask whether resilience should be understood in the first place.

There is a consensus that measurements of resilience are needed to prioritise actions for DRR, monitor changes, whether for the better or the worse, and make agencies that claim to work towards strengthening resilience accountable to their donors (Béné, 2013). Such concerns are understandable given contemporary policies and practices for DRR. Hence, measuring resilience constitutes a pragmatic response to those needs and QPMs and participatory numbers provide an opportunity for pulling together "the best of all worlds", to expand an expression coined by Barahona and Levy (2007).

However, asking whether resilience can be understood begs the broader question of power and power relations in DRR, hence, in other words, whose resilience is measured by whom and for whom. Do those who are facing natural hazards and disasters need their resilience to be measured, especially by outsiders, and who is benefiting from such measurements? Resilience remains a poorly-defined Western concept with a Latin origin. Hence, it hardly translates in non-Latin languages and attempting to capture and/or measure whatever it means in the eyes of Western outsiders may just, most often inadvertently, satisfy the appetite of the latter more than answer a local need. As Bhatt (1998: 71) so eloquently put it in the context of vulnerability, another concept of Latin origin, an outsider is likely to be "filtering what she or he reads through the conceptual framework, assumptions, and values or her or his culture and, as a result, is creating false 'stories' that fit her or his expectations".

None of the existing approaches to measuring resilience, except in the field of psychology that has been purposefully excluded from this chapter, focuses on the individual level. Hence, all, including

those measurements of resilience at the household level, entail and accept some form of generalisation. Those people and places whose resilience are measured are therefore seen as “indistinguishable from one another, as controllable, homogenous objects of study who can be reduced to generalized data and explained” (Bhatt, 1998: 71-72). In this sense, measuring resilience reflects an attempt at rationalising society through producing new, standardised knowledge, which, for Foucault (1975), is inevitably linked to exercising power and better controlling individuals. In the context of DRR, this means justifying the implementation of projects, designed by Western institutions, upon those at risk. On a broader scale, this contributes to reinforcing the long-lasting artificial divide between a knowledgeable, resilient world, on the one hand, and an inferior and dangerous world, on the other hand (Hewitt, 1995; Bankoff, 2001). For most of its proponents, the contemporary frantic quest for enhancing measurements of resilience may therefore constitute neither more nor less than the perpetuation of the dominant hazard paradigm and its neo-colonial agenda disguised under a sexier gaze.

Reference

- Ahern N.R., Kiehl E.M., Sole M.L., Byers J. (2006) A review of instruments measuring resilience. *Issues in Comprehensive Pediatric Nursing* 29(2): 103-125.
- Alexander D. (2013) Resilience and disaster risk reduction: an etymological journey. *Natural Hazards and Earth System Sciences* 13: 2707–2716.
- Anderson M.B., Woodrow P. (1989) *Rising from the ashes: development strategies in times of disasters*. Westview Press, Boulder.
- Bankoff G. (2001) Rendering the world unsafe: 'vulnerability' as western discourse. *Disasters* 25(1): 19-35.
- Barahona C., Levy S. (2007) The best of both worlds: producing national statistics using participatory methods. *World Development* 35(2): 326-341.
- Beccari B. (2016) A comparative analysis of disaster risk, vulnerability and resilience composite indicators. *PLOS Currents Disasters* 1: 10.1371/currents.dis.453df025e34b682e9737f95070f9b970.
- Béné C. (2013) *Towards a quantifiable measure of resilience*. Working Paper No. 434, Institute of Development Studies Work, Brighton.
- Béné C., Al-Hassan R.M., Amarasinghe O., Fong P., Ocran J. Onumah E., Ratuniata R., Van Tuyen T., Allister McGregor J., Mills D.J. (2016) Is Resilience socially constructed? Empirical evidence from Fiji, Ghana, Sri Lanka, and Vietnam. *Global Environmental Change* 38: 153-170.
- Bhatt M.R. (1998) Can vulnerability be understood? In J. Twigg and M.R. Bhatt (Eds) *Understanding vulnerability: South Asian perspectives*. Intermediate Technology Publications, London, pp. 68-77.
- Buckle P. (2006) Assessing social resilience. In D. Paton and D. Johnston (Eds) *Disaster resilience: an integrated approach*. Charles C. Thomas Publisher, Springfield, pp. 88-104.
- Burton I., Kates R.W., White G.F. (1978) *The environment as hazard*. Oxford University Press, New York.
- Cannon T., Titz A., Krüger F. (2014) The myth of community? In International Federation of Red Cross and Red Crescent Societies (Ed.) *World disaster report: focus on culture and risk*. International Federation of Red Cross and Red Crescent Societies, Geneva, pp. 92-119.

- Chambers R. (1983) *Rural development: putting the last first*. Longmans, London.
- Chambers R. (1984) *Rapid rural appraisal: rationale and repertoire*. *Public Administration and Development* 1(2): 65-106.
- Chambers R. (2003) *Participation and numbers*. *PLA Notes* 47: 6-12.
- Chambers R. (2007a) *Poverty research: methodologies, mindsets and multidimensionality*. Working Paper No. 293, Institute of Development Studies, Brighton.
- Chambers R. (2007b) *Who counts? The quiet revolution of participation and numbers*. Working Paper No. 296. Institute of Development Studies, Brighton.
- Chambers R. (2010) *A revolution whose time has come? The win-win of quantitative participatory approaches and methods*. *IDS Bulletin* 41(6): 45-55.
- Cooke B., Kothari K. (eds.) (2001) *Participation: the new tyranny?* Zed Books, London.
- Cutter S., Burton C.G., Emrich C.T. (2010) *Disaster resilience indicators for benchmarking baseline conditions*. *Journal of Homeland Security and Emergency Management* 7(1): Art. 51.
- Delica-Willison Z., Gaillard J.C. (2012) *Community action and disaster*. In B. Wisner, J.C. Gaillard and I. Kelman (Eds) *Handbook of hazards and disaster risk reduction*. Routledge, Abingdon, pp. 711-722.
- Folke C., Carpenter S., Elmqvist T., Gunderson L., Holling C.S., Walker B., Bengtsson J., Berkes F., Colding J., Danell K., Falkenmark M., Gordon L., Kasperson R., Kautsky N., Kinzig A., Levin S., Mäler K.-G., Moberg F., Ohlsson L., Olsson P., Ostrom E., Reid W., Rockström J., Savenije H. and Svedin U. (2002) *Resilience and sustainable development: building adaptive capacity in a world of transformations*. Scientific Background Paper on Resilience for the process of The World Summit on Sustainable Development, The Environmental Advisory Council to the Swedish Government, Stockholm.
- Foucault M. (1975) *Surveiller et punir: naissance de la prison*. Gallimard, Paris.
- Freire P. (1970) *Pedagogy of the oppressed*. Bloomsbury, London.
- Gaillard J.C. (2010) *Vulnerability, capacity, and resilience: perspectives for climate and development policy*. *Journal of International Development* 22(2): 218-232.
- Gaillard J.C., Mercer J. (2013) *From knowledge to action: bridging gaps in disaster risk reduction*. *Progress in Human Geography* 37(1): 93-114.
- Gaillard J.C., Cadag J.R.D., Gampell A., Hore K., Le Dé L., McSherry A. (2016) *Participatory numbers for integrating knowledge and actions in development*. *Development in Practice*: in press.
- Gordon J.E. (1978) *Structures*. Penguin Books, Harmondsworth.
- Hastrup F. (2011) *Weathering the world: recovery in the wake of the tsunami in a Tamil fishing village*. Berghahn, New York.
- Hewitt K. (1983) *The idea of calamity in a technocratic age*. In K. Hewitt (Ed.) *Interpretation of calamities*. The Risks and Hazards Series No. 1, Allen & Unwin Inc, Boston, pp. 3-32.
- Hewitt K. (1995) *Sustainable disasters? Perspectives and powers in the discourse of calamity*. In J. Crush (Ed.), *Power of development*. Routledge, London, pp. 115-128.

- Holland J. (2013) *Who counts? The power of participatory statistics*. Practical Action Publishing, Rugby.
- Holling C.S. (1973) Resilience and stability of ecological systems. *Annual Review of Ecology and Systematics* 4: 1-23.
- Levine S. (2014) *Assessing resilience: why quantification misses the point*. Working Paper, Humanitarian Policy Group, Overseas Development Institute, London.
- Manyena S.B. (2006) The concept of resilience revisited. *Disasters* 30(4): 433-450.
- Manyunga J.S. (2009) *Measuring the measure: a multi-dimensional scale model to measure community disaster resilience in the U.S. Gulf Coast region*. PhD dissertation, Texas A&M University, College Station.
- Mileti D. (1999) *Disasters by design: a reassessment of natural hazards in the United States*. Joseph Henry Press, Washington.
- Norris F.H., Stevens S.P., Pfefferbaum B., Wyche K.F., Pfefferbaum, R.L. (2008) Community resilience as a metaphor, theory, set of capacities, and strategy for disaster readiness. *American Journal of Community Psychology* 41(1): 127-150.
- O'Keefe P., Westgate K., Wisner B. (1976) Taking the naturalness out of natural disasters. *Nature* 260(5552): 566-567.
- Oliver-Smith A. (1996) Anthropological research on hazards and disasters. *Annual Review of Anthropology* 25: 303-328.
- Ostadtaghizadeh A., Ardalan A., Paton D., Jabbari H., Khankeh H.R. (2015) Community disaster resilience: a systematic review on assessment models and tools. *PLOS Currents Disasters* 1: 10.1371/currents.dis.f224ef8efbdfcf1d508dd0de4d8210edHallegatte et al.'s (2016)
- Pelling M. (2003) *The vulnerabilities of cities: natural disasters and social resilience*. Earthscan, London.
- Ride A., Bretherton D. (2011) *Community resilience in natural disasters*. Palgrave Macmillan, New York.
- Shaw R., P.G. Dhar Chakrabarti, Gupta M. (2010) *India city profile: climate and disaster resilience: consultation report*. Kyoto University / National Institute of Disaster Management / SEEDS India, Kyoto / New Delhi.
- Simpson E. (2014) *The political biography of an earthquake: aftermath and amnesia in Gujarat, India*. Hurst Publishers, London.
- Timmerman P. (1981) *Vulnerability, resilience and the collapse of society: a review of models and possible climatic applications*. Environmental Monograph No. 1, Institute for Environmental Studies, University of Toronto, Toronto.
- Torry W.I. (1979a) Intelligence, resilience and change in complex social systems: famine administration in India. *Mass Emergencies* 2: 71-85.
- Torry W.I. (1979b) Anthropological studies in hazardous environments: past trends and new horizons. *Current Anthropology* 20(3): 517-540.
- Twigg J. (2009) *Characteristics of a disaster-resilient community: a guidance note*. Version 2, Aon Benfield UCL Hazard Research Centre, University College London, London.

- United Nations Development Programme Drylands Development Centre (2014) Community Based Resilience Analysis (CoBRA) conceptual framework and methodology. United Nations Development Programme Drylands Development Centre, New York.
- United Nations International Strategy for Disaster Reduction (2002) Living with risk: a global review of disaster reduction initiatives. United Nations International Strategy for Disaster Reduction, Geneva.
- Vietnam Red Cross Society (2000) Disaster preparedness manual. Vietnam Red Cross Society, Hanoi.
- Weichselgartner J., Kelman I. (2015) Geographies of resilience: Challenges and opportunities of a descriptive concept. *Progress in Human Geography* 39(3): 249-267.
- Werner E.E., Bierman J.M., French F.E. (1971) The children of Kauai: a longitudinal study from the prenatal period to age ten. University of Hawai'i Press, Honolulu.
- White G.F. (1974) Natural hazards: local, national, global. Oxford University Press, New York.
- Winderl T. (2014) Disaster resilience measurements: stocktaking of ongoing efforts in developing systems for measuring resilience. United Nations Development Programme, New York.
- Windle G., Bennet K.M., Noyes J. (2011) A methodological review of resilience measurement scales. *Health and Quality of Life Outcomes* 9(8): DOI: 10.1186/1477-7525-9-8
- Wisner B. (1993) Disaster vulnerability: scale, power, and daily life. *Geojournal* 30(2): 127-140.
- Wisner B., Blaikie P., Cannon T., Davis I. (2004) At risk: natural hazards, people's vulnerability, and disasters. 2nd ed., Routledge, London.
- Wisner B., Gaillard J.C., Kelman I. (2012) Handbook of hazards and disaster risk reduction. Routledge, Abingdon.