The concept of resilience revisited

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The intimate connections between disaster recovery by and the resilience of affected communities have become common features of disaster risk reduction programmes since the adoption of The Hyogo Framework for Action 2005–2015. Increasing attention is now paid to the capacity of disaster-affected communities to 'bounce back' or to recover with little or no external assistance following a disaster. This highlights the need for a change in the disaster risk reduction work culture, with stronger emphasis being put on resilience rather than just need or vulnerability. However, varied conceptualisations of resilience pose new philosophical challenges. Yet achieving a consensus on the concept remains a test for disaster research and scholarship. This paper reviews the concept in terms of definitional issues, the role of vulnerability in resilience discourse and its meaning, and the differences between vulnerability and resilience. It concludes with some of the more immediately apparent implications of resilience thinking for the way we view and prepare for disasters.

Introduction

Over the past ten years, work on disasters has increasingly focused on the capacity of affected communities to recover with little or no external assistance. This requires a stronger emphasis on approaches to risk reduction and humanitarian and development work that put resilience, rather than just need or vulnerability, at the nucleus of the debate (IFRC, 2004). Current thinking on resilience is a product of theoretical and practical constructs that have seen the refining and reshaping of the disaster paradigm over the past three decades. The history of its application is not rosy; it is full of contestations, especially regarding its affinity with and lucid usage by a multiplicity of disciplines. Consequently, it is instructive to explore the concept within the context of the ongoing search for the most appropriate disaster risk reduction framework.

Resilience is derived from the Latin word *resilio,* meaning 'to jump back' (Klein, Nicholls and Thomalla, 2003). The field in which it was originally used, though, is still contested: some say ecology (Batabyal, 1998), while others say physics (Van der Leeuw and Leygonie, 2000). In the sphere of ecology, it gained currency following the 1973 release of Holling's seminal work, entitled *Resilience and Stability of Ecological Systems* (Blaikie and Brookfield, 1987; Levin et al., 1998; Adger, 2000; Van der Leeuw and Leygonie, 2000; Stockholm Environmental Institute, 2004). Most of the literature, however, states that the study of resilience evolved from the disciplines of psychology and psychiatry in the 1940s, and it is mainly accredited to Norman Garmezy, Emmy Werner and Ruth Smith (Waller, 2001; Johnson and Wielchelt, 2004). It materialised

as a result of efforts to understand the aetiology and development of psychopathology, most particularly in studies of children 'at risk' of psychopathological disorders due to parental mental illness, perinatal problems, inter-parental conflict, poverty or a combination of the above (Masten, 1999; Rolf, 1999). The pioneers in the study of resilience were interested in analysing risks and the negative effects of adverse life events on children, such as divorce and traumatic stressors (abuse, neglect and war, for example). These studies saw the emergence of terms such as *'resilience', 'stress-resistance'* and *'invulnerability'*. Of the three constructs, resilience has become one of the most disputed.

Today, resilience is being applied in a number of fields, especially disaster management. The adoption, on 22 January 2005, of The Hyogo Framework for Action 2005–2015—also known as 'The Hyogo Declaration'—by the United Nations International Strategy for Disaster Risk Reduction (UNISDR) is a positive move. Increased attention will be paid to what affected communities can do for themselves and how best to strengthen them (IFRC, 2004). Yet, if the concept of resilience is to lead to a new way of tackling disasters and provide policy options, there is a need to address the philosophical questions that continue to blur the concept. To enhance resilience it is necessary to have a good initial understanding of what it is, its determinants (Klein et al., 1998), and how it can be measured, maintained and improved (Klein, Nicholls and Thomalla, 2003).

This paper focuses mainly on four aspects of resilience: the definitional issue of resilience; whether resilience is the opposite of vulnerability; how resilience applies to people and structures; and the implications of the deconstruction of the term for the way we view disasters and disaster risk reduction.

Methodology

Background information for this article came from primary and secondary sources. The primary data were collected through personal communication and group e-mails; requests were directed at those who have distinguished themselves in disaster scholarship and research. Many of the people contacted sent detailed responses, involving, in some instances, pages of comment on the subject.

Disaster resilience: a paradigm or expression?

The entrance of the term resilience into disaster discourse could be seen as the birth of a new culture of disaster response. The outcomes of the 2005 World Conference on Disaster Reduction (WCDR) confirmed that the concept has gradually found more space in both theoretical and practical terms in a wide range of disaster risk reduction discourse areas and in some interventions. Phrases like *'sustainable and resilient communities', 'resilient livelihoods'* and *'building community resilience'* have become common in journal articles and programme documents. However, while some would refer to it as a new paradigm (McEntire et al., 2002), others see it as more of an expression, complimenting use of other disaster terms, such as vulnerability or risk.

The theoretical base of disaster resilience centres on a range of studies. Bradely and Grainger (2004) recommend a social resilience model in which actors switch from performance to survival strategies when the perceived severity of constraints exceeds a critical threshold. Tobin (1999) suggests a composite sustainable and resilient framework of analysis for communities in hazardous environments. Paton, Smith and Violanti (2000) propose a risk management model for disaster stress, while Paton and Johnston (2001) advocate a model of resilience to hazard effects. Meanwhile, Mallak (1998), Kendra and Wachtendorf (2003) and Davis (2004) have all put forth some principles of resilience.

The work of McEntire et al. (2002) traces the evolution of 'disaster paradigms', although without a timeline, from comprehensive disaster management through disaster-resistant community, disaster-resilient communities and sustainable development and sustainable hazards mitigation, and invulnerable development, to comprehensive vulnerability management. The intention here, though, is not to get into a debate on the characteristics of the paradigm, the 'resilience paradigm', as it has become known, which arguably falls short of warranting such a label. The concept of resilience has gained currency in the absence of philosophical dimensions and clarity of understanding, definition, substance, and most importantly, its applicability in disaster management and sustainable development theory and practice.

There is a danger of current usage extending further into the practitioner end of disaster and development work in order to describe the quality of 'end' products of disaster-risk reduction interventions. Some scholars contacted during the information-gathering process for this paper were of the opinion that (disaster) resilience can not necessarily be viewed as a new way of looking at disasters 'as we have done much of this before'[1] and therefore it is not new conceptually. The only new thing is the inclusion of 'resilience' in disaster and development discourse. The concept of disaster resilience has 'confused things'.[2] For instance:

> The ecological literature has moved to using the term adaptive capacity, with resilience (the amount of deformation or disturbance a system can withstand before it loses a capacity to bounce back) as a subset . . . its (resilience) value will only be retained if definitional issues are resolved and more systematic work is conducted in outcomes and predictive processes.[3]

The concept has prompted a new way of conceptualising hazards and their consequences, 'as it suggests focusing on building something up rather than just reducing something, which is the case when talking about poverty or vulnerability reduction'.[4] Recently, in addition to environmental determinism (Middleton and O'Keefe, 1998), which was viewed as an adequate account of human disasters, political and socio-economic conditions have received recognition, coinciding in space and time with an extreme 'trigger event' natural hazard to which a certain group of people has been made vulnerable. This has made an immense contribution to our understanding of the interrelationship among hazard, risk and vulnerability. Deficient information, communications and knowledge among social actors, the lack of institutional and community organisation, weaknesses in emergency preparedness, political instability and the absence

of economic health in a geographic area, are all factors in generating greater risk (Cardona, 2004).

Risk and vulnerability, however, have not been conceptualised in a comprehensive manner. Instead, fragmentation has been common: risk has been estimated according to different disciplinary approaches; the same applies to vulnerability, which has been defined within disciplinary 'ghettos'. To estimate risk on a multidisciplinary basis, one needs to be aware not only of the expected physical damage and of the victims or economic losses, but also of social, organisational and institutional aspects. At the urban scale level, for example, vulnerability—seen as an internal risk variable—must be related not only to exposure of the material context or the physical susceptibility of the exposed elements, but also to social frailties and the degree of resilience of the prone communities. This necessitates looking beyond the capacity to respond or to absorb the impact and considering the essential and non-essential elements of community systems able to adapt to and survive the shocks.

The concept of resilience helps us to obtain a complete understanding of risk and vulnerability. It fills a void by addressing the 'soft perspective' of vulnerability and allows us to rethink the prevalent 'risk = hazard x vulnerability' equation.

Focusing on resilience directly, rather than vulnerability or poverty reduction, is important for another reason too. Disaster resilience activities can 'lead to actions such as enhancing community coping capacity and livelihoods',[5] allowing communities to make appropriate choices within the context of their environments.

> *Resilience is rooted in making choices about future losses when development decisions are made. Choosing what is lost in future disasters is absolutely a new way to view those losses since it places 100% responsibility for those losses on people versus nature.*[6]

Expressing things in a new way can encourage people to grasp abstraction or assist them in doing so. For example, the term 'road map' has gained currency in developmental circles, but could we say the road map of today is the same as or different from a 'blueprint'? The answer perhaps has to do with language: societal metaphors are popularised for a period, until another expression replaces them.[7] However, words are prisons, as well as searchlights and pigeonholes, for what we see (Stibbs, 1998). Metaphors and linguistic 'accidents' have a historical habit of referring to something objectively real when it is not (Smith and O'Keefe, 1996). Using words without a clear definition or categorisation makes it difficult to come up with a clear concept. Disaster resilience could be viewed as a new phrase describing a desired outcome of a disaster risk reduction programme; but it does not deal with the unique condition itself. With this in mind, it is perhaps safe now not to label it as a paradigm but as 'a lens or entry point'[8] or to see it as the beginning of a search for a new paradigm.

Disaster resilience as a process or an outcome?

The answer to this question may constitutes a fundamental step towards the building of a resilience paradigm. In the disaster field, where sociology and geography are at the

core of scholarship and research, inroads have been made with definitional issues, as Box 1 shows. The definitions are diverse, reflecting the complexity of society and thinking on society and disasters. However, unless we clarify concepts and reach a minimum consensus on the defining features, we will continue to talk past one another (Quarantelli, 1995) on what disaster resilience entails.

Resilience has been generally defined in two broad ways: as a desired outcome(s) or as a process leading to a desired outcome(s) (Kaplan, 1999). Admittedly, categorising definitions as outcome- or process-oriented is no easy task and the distinction may seem unnecessary. A close look at the definitions in Box 1, though, reveals a gradual refinement in the way we conceptualise disaster resilience: from more outcome-oriented to more

Box 1 Definitions of resilience

Author	Definition
Wildavsky, 1991	Resilience is the capacity to cope with unanticipated dangers after they have become manifest, learning to bounce back.
Holling et al., 1995	It is the buffer capacity or the ability of a system to absorb perturbation, or the magnitude of disturbance that can be absorbed before a system changes its structure by changing the variables.
Horne and Orr, 1998	Resilience is a fundamental quality of individuals, groups and organisations, and systems as a whole to respond productively to significant change that disrupts the expected pattern of events without engaging in an extended period of regressive behaviour.
Mallak, 1998	Resilience is the ability of an individual or organisation to expeditiously design and implement positive adaptive behaviours matched to the immediate situation, while enduring minimal stress.
Miletti, 1999	Local resiliency with regard to disasters means that a locale is able to withstand an extreme natural event without suffering devastating losses, damage, diminished productivity, or quality of life without a large amount of assistance from outside the community.
Comfort, 1999	The capacity to adapt existing resources and skills to new systems and operating conditions.
Paton, Smith and Violanti, 2000)	Resilience describes an active process of self-righting, learned resourcefulness and growth—the ability to function psychologically at a level far greater than expected given the individual's capabilities and previous experiences.
Kendra and Wachtendorf, 2003	The ability to respond to singular or unique events.
Cardona, 2003	The capacity of the damaged ecosystem or community to absorb negative impacts and recover from these.
Pelling, 2003	The ability of an actor to cope with or adapt to hazard stress.
Resilience Alliance, 2005	Ecosystem resilience is the capacity of an ecosystem to tolerate disturbance without collapsing into a qualitatively different state that is controlled by a different set of processes. A resilient ecosystem can withstand shocks and rebuild itself when necessary. Resilience in social systems has the added capacity of humans to anticipate and plan for the future.
UNISDR, 2005	The capacity of a system, community or society potentially exposed to hazards to adapt, by resisting or changing in order to reach and maintain an acceptable level of functioning and structure. This is determined by the degree to which the social system is capable of organising itself to increase this capacity for learning from past disasters for better future protection and to improve risk reduction measures.

process-oriented. Undoubtedly, earlier authors were thinking of resilience as a process to reach an outcome. However, use of the terms 'cope', 'bounce back', 'withstand' or 'absorb negative impacts' to return to 'normal' within the shortest possible time, tend to emphasise a reactive stance. The latter description might be more appropriate for objects capable of regaining their original shape after bending, stretching, compression or other types of deformation.

When referring to people, the essence of resilience centres on quick recovery from shock, illness or hardship. One who is resilient may be considered irrepressible, buoyant, enduring, flexible; the person who bounces back—unchanged—from exposure to stresses and shocks (Vickers and Kouzmin, 2001). Disaster resilience is seen as the 'shield', 'shock absorber' or buffer that moderates the outcome to ensure benign or small-scale negative consequences. Indeed, the goal of disaster risk management is to guarantee minimal loss of life and livelihoods and to allow the affected community or system to return to 'normal' within the shortest possible time. While it would be unreasonable to present this in a negative light, it is important to point out that resilience is arguably about people's capacity far beyond the minimum of being able to cope. Merely defining resilience on the basis of minimum standards of development and relief may be an inadequate conceptual and practical application of the approach, which fails to realise people's aspirations to be outside the high risk zone altogether.

The danger of viewing disaster resilience as an outcome is the tendency to reinforce the traditional practice of disaster management, which takes a reactive stance (McEntire et al., 2002). Disaster management interventions have a propensity to follow a paternalistic mode that can lead to the skewing of activities towards supply rather than demand. Activities such as community capacity building, mitigation and emergency preparedness planning, which impact greatly on response and recovery operations, may be neglected (McEntire et al., 2002). The United Kingdom's Resilience Programme, for example, is laudable and will improve the coordinated response capabilities of emergency services, other government agencies and utilities. However, broad-scale community involvement is not part of the United Kingdom government's resilience strategy. In the event of disasters that will overstretch emergency services, responses will 'naturally' become the responsibility of affected communities. Some see the resilience programme as a new version of the paternalistic civil defence approach employed during the Cold War (Alexander, 2002) and applied in the wake of more complicated terrorist threats. Outcome-oriented disaster resilience programmes are inclined to adopt command and control styles that risk preserving the status quo, and which might entrench exclusion, and take attention away from the inequality, oppression and entitlement loss that results in cases of proneness to insecurity and disaster.

Viewing disaster resilience as a deliberate process (leading to desired outcomes) that comprises a series of events, actions or changes to augment the capacity of the affected community when confronted with singular, multiple or unique shocks and stresses, places emphasis on the human role in disasters. Disaster resilience is seen as a quality, characteristic or result that is generated or developed by the processes that foster or promote it. Put differently, resilience is not a science nor does it deal with regularities

in our experience, but rather, it is an art that addresses singularities as we experience them (Weinberg, 1985). For instance, recognising the human role in disasters, taking responsibility for action, having a disaster plan, building capabilities to implement the plan, purchasing insurance and sharing information on recovery priorities are steps that can enhance the resilience and hence the ability of an individual, group, community or nation to deal with unique destabilising situations. In this case, therefore, resilience is a goal that we should strive to achieve or a quality that we should try to attain.[9]

The concept of 'adaptation' has featured in some definitions, particularly those related to ecological systems; this aspect of resilience is more about the process-oriented outcome. Adaptation makes resilience both a contextual and personal construct because it depends on the high-risk status or degree of exposure of the people in danger and their person-alised adaptive strategies. Resilience has a futuristic dimension as adaptation occurs in the post-disaster phase: it is a strategy to mitigate future disasters. Communities in the drought stricken Zambezi Valley of Zimbabwe, for example, have adapted to unreliable rainfall by growing 'nzembwe', a drought-resistant type of millet produced in response to drought spells experienced during the rainy season. In other words, these communities have maintained their core values or assets but have addressed non-essential elements, such as growing crops like maize, which require high amounts of rainfall. This means that systems resilience (capacity to survive) is built on that system's ability to alter non-essential attributes—to adapt in order to survive.

This has important implications for policy. For instance, if a rural community of Bangladesh or Mozambique is perceived as unsustainable and threatened by seasonal flooding, do we respond with 1) forced resettlement, where the core system, local livelihoods and culture can be lost, or 2) adaptive rural livelihoods development in situ, where livelihoods and culture are preserved? The core difference here pertains to the object to which we are conferring resilience.[10] Individuals, communities or nations have a degree of resilience, which can be defined in terms of their primary survival values or assets—life, livelihoods and culture. From this vantage point, the goal of any 'disaster resilience' programme will be to enhance the fundamental values, assets and resources that can be applied to the process of adapting to adverse circumstances.

The relationship between vulnerability and resilience

Resilience and vulnerability are common, related concepts in a number of scientific disciplines (Klein et al., 1998) and they have gained currency in disaster work. A key question that emerges, however, concerns the relationship between them. Is resilience the opposite of vulnerability? Is resilience a factor of vulnerability? Or is it the other way around? Again, it is not easy to provide single answers to these questions. Addressing this relationship, though, is key to defining the meaning, implications and applications of resilience.

The term vulnerability entered the disaster discourse in the 1970s. Phil O'Keefe, Ken Westgate and Ben Wisner (1976) argue in 'Taking the naturalness out of natural disasters' that disasters were more a consequence of socio-economic vulnerability than natural

factors. Mechanical and systems engineers first used the expression vulnerability in relation to different forms of construction, such as housing, bridges and factories (Twigg, 1998). However, the concept's popularisation is mainly credited to Peter Timmerman and his monograph entitled *Vulnerability, Resilience and the Collapse of Society,* in which he begins to link the concepts of resilience and vulnerability (Cardona, 2003). But vulnerability as a concept 'does not rest on a well developed theory; neither is it associated with widely accepted indicators or measurements' (Watts and Bohle, 1993, p. 45).

There are more than two dozen definitions of vulnerability—Boxes 2 and 3 list some of them. The multiplicity of definitions is important and potentially useful in the theoretical expansion of this domain as well as in examining the ramifications of understanding and theoretical development of the way we choose to comprehend and react to the critical issues that vulnerability studies represent. The following quote, however, encapsulates one further reason:

> *Science can only win when scholars focus upon an idea and bring their unique perspectives to the elucidation of this idea . . . We must continually re-examine exciting ideas to make sure that they are worthy of the intellectual resources focused upon them* (Kaplan, 1999, p. 18).

The multiplicity of definitions is a reflection of the philosophical and methodological diversities that have emerged from disaster scholarship and research. There are two distinct sources of vulnerability literature where the term is used with reference to natural hazards: geography; and natural sciences. In development and welfare economics, the phrase has been popularised following the release of the work of Robert Chambers and Amartya Sen on rural development and entitlements, respectively (Schoon, 2005). What is encouraging is the general consensus that seems to show that vulnerability to disaster is determined not simply by a lack of wealth, but rather by a complex range of physical, economic, political and social factors or the predisposition of a community to damage by a destabilising phenomena involving an interdependent natural hazard and anthropogenic pressures (O'Keefe, Westgate and Wisner, 1976; Susman, O'Keefe and Wisner, 1983; Cutter, 1996; Twigg, 1998; Weichselgartner, 2001; Pelling and Uitto, 2001; Cardona, 2003; Cutter, Boruff and Shirley, 2003; Cardona, 2004; Wei et al., 2004; Blaikie et al. 2004). The literature makes a distinction between human vulnerability, social vulnerability and physical vulnerability: non-human elements are described in terms of ecological and environmental fragility.

Whether resilience and vulnerability are positive and negative poles on a continuum depends on how we define the two terms. If we accept the definitions in Box 2, where vulnerability is related to the degree of capacity, then vulnerability is closely associated with the level of resilience. There is no fundamental difference in the definitions of resilience (Box 1) and the definitions of vulnerability (Box 2). This suggests that the two concepts are opposites or two sides of the same equation on a continuum. Consequently, the definitions are dependent on the reference framework or the distance from the furthest negative and positive pole points. If one is situated more towards the positive pole of the continuum, one becomes more resilient than vulnerable, and vice versa. The

Box 2 Definitions of vulnerability more related to disaster resilience

Author	Definition
Timmerman, (1981)	Vulnerability is the degree to which a system acts adversely to the occurrence of a hazardous event. The degree and quality of the adverse reaction are conditioned by a system's resilience (a measure of the system's capacity to absorb and recover from the event).
Pijawka and Radwan, 1985	Vulnerability is the threat or interaction between risk and preparedness. It is the degree to which hazardous materials threaten a particular population (risk) and the capacity of the community to reduce the risk or adverse consequences of hazardous material releases.
Dow, 1992	Vulnerability is the differential capacity of groups and individuals to deal with hazards, based on their positions within physical and social worlds.
Watts and Bohle, 1993	Vulnerability is defined in terms of exposure, capacity and potentiality. Accordingly, the prescriptive and normative response to vulnerability is to reduce exposure, enhance coping capacity, strengthen recovery potential and bolster damage control (i.e., minimise destructive consequences) via private and public means.
Blaikie et al., 1994	By vulnerability we mean the characteristics of a person or a group in terms of their capacity to anticipate, cope with, resist and recover from the impact of a natural hazard. It involves a combination of factors that determine the degree to which someone's life and livelihood are put at risk by a discrete and identifiable event in nature or in society.
Green et al., 1994	Vulnerability to flood disruption is a product of dependence (the degree to which an activity requires a particular good as an input to function normally), transferability (the ability of an activity to respond to a disruptive threat by overcoming dependence either by deferring the activity in time, or by relocation, or by using substitutes), and susceptibility (the probability and extent to which the physical presence of flood water will affect inputs or outputs of an activity).
Bohle, Downing and Watts, 1994	Vulnerability is best defined as an aggregate measure of human welfare that integrates environmental, social, economic and political exposure to a range of potential harmful perturbations. Vulnerability is a multilayered and multidimensional social space defined by the determinate, political, economic and institutional capabilities of people in specific places at specific times
Weichselgartner and Bertens, 2000	By vulnerability, we mean the condition of a given area with respect to hazard, exposure, preparedness, prevention, and response characteristics to cope with specific natural hazards. It is a measure of the capability of this set of elements to withstand events of a certain physical character.

Source: adapted from Weichselgartner, 2001

Resilience Alliance, a network of ecology scientists set up to inform policy on sustainable development through research (Klein, Nicholls and Thomalla, 2003), sees vulnerability of a system as resulting from reduced resilience. In other words, something very vulnerable is not very resilient and the other way around. In this case, resilience is a factor of vulnerability and vulnerability is a factor of resilience.[11] But this kind of interpretation is rather simplistic and myopic and lends itself to what Klein, Nicholls and Thomalla (2003) term circular reasoning: a system is vulnerable because it is not resilient; it is not resilient because it is vulnerable.

If we accept the definitions in Box 3, which have little or no relation with the definitions of resilience, then vulnerability and resilience may not be related at all. Vulnerability is seen as: a 'threat' or 'exposure' to a hazard; the degree of potential for loss; or circumstances that put people at risk, including social, economic, political, technological,

Box 3 Definitions of vulnerability with a different type of or less strong relationship with disaster resilience

Author	Definition
Gabor and Griffith, 1980	Vulnerability is the threat (to hazardous materials) to which people are exposed (including chemical agents and the ecological situation of the communities and their level of emergency preparedness). Vulnerability is the risk context.
UNDRO, 1982	Vulnerability is the degree of the loss to a given element or set of elements at risk resulting from the occurrence of a natural phenomenon of a given magnitude.
Susman, O'Keefe and Wisner, 1983	Vulnerability is the degree to which different classes of society are differentially at risk.
Mitchell, 1989	Vulnerability is the potential for loss.
Liverman, 1990	The author distinguishes between vulnerability as a biophysical condition and vulnerability as defined by political, social and economic conditions of society. She argues for vulnerability in geographic space (where vulnerable people and places are located) and vulnerability in social space (who in that place is vulnerable).
Downing, 1991	Vulnerability has three connotations: it refers to a consequence (e.g. famine) rather than a cause (e.g. drought); it implies an adverse consequence (e.g., maize yields are sensitive to drought; households are vulnerable to hunger); and it is a relative term that differentiates among socioeconomic groups or regions, rather than an absolute measure or deprivation.
UNDRO, 1991	Vulnerability is the degree of the loss to a given element or set of elements at risk resulting from the occurrence of a natural phenomenon of a given magnitude and expressed on a scale from 0 (no damage) to 1 (total loss). In lay terms, it means the degree to which the individual, family, community, class or region is at risk of suffering a sudden and serious misfortune following an extreme natural event.
Alexander, 1993	Human vulnerability is function of the costs and benefits of inhabiting areas at risk of natural disaster.
Cutter, 1993	Vulnerability is the likelihood that an individual or group will be exposed to and adversely affected by a hazard. It is the interaction of the hazard of place (risk and mitigation) with the social profile of communities.
Dow and Downing, 1995	Vulnerability is the differential susceptibility of circumstances contributing to vulnerability. Biophysical, demographic, economic, social and technological factors such as population ages, economic dependency, racism and age of infrastructure are some factors which have been examined in association with natural hazard.
Gilard and Givone, 1997	Vulnerability represents the sensitivity of land use to the hazard phenomenon.
Comfort et al., 1999	Vulnerability are those circumstances that place people at risk while reducing their means of response or denying them available protection

Source: adapted from Weichselgartner, 2001

biophysical and demographic aspects. Yet, the definitions in Boxes 2 and 3 are also closer to the definition of risk and some of them implicitly include the concept of disaster resilience because they are more broad and comprehensive; most have contributed to the conceptual confusion. Vulnerability could be viewed as a reflection of the intrinsic physical, economic, social and political predisposition or susceptibility of a community to be affected by or suffer adverse effects when struck by a dangerous physical phenom–enon of natural or anthropogenic origin. It also signifies a low level (rather than a lack)

of disaster resilience, limiting capacity to recover; each system has some degree of resilience. Disaster resilience could be viewed as the intrinsic capacity of a system, community or society predisposed to a shock or stress to adapt and survive by changing its non-essential attributes and rebuilding itself.

Douglas Paton is of the view that the two concepts should be considered as discrete entities:

> . . . we can possess characteristics that can make us vulnerable and that can influence our capacity to adapt at the same time. . . . Until it can be demonstrated to the contrary, I think they should be viewed as discrete.[12]

Larry Mallak also is of the opinion that resilience and vulnerability, although often viewed as opposites, are two distinctly separate constructs:

> I think a good parallel is Herzberg's two-factor theory . . . they essentially impact job satisfaction and job dissatisfaction, which Herzberg argues are not opposites. The absence of job dissatisfaction does not mean that you have job satisfaction. Here, too, with resilience: the absence of vulnerability does not make one resilient.[13]

Phil O'Keefe argues that while vulnerability is not necessarily the 'flip side' of resilience, it does not mean that we can fold vulnerability into resilience or vice versa. 'How we produce environment and how to change environment are key to understanding social resilience'.[14]

In sum, two views have emerged: one sees disaster resilience and vulnerability as factors of each other, while the other sees them more as separate entities. The latter section of this paper assesses the implications.

Does resilience refer to people or physical infrastructure or both?

The establishment of the Resilience Alliance, and the adoption of the term by the UNISDR in its strategy for 2005–15, underlines the importance of the concept in modern times. Yet it remains uncertain whether resilience refers to natural, social, technological or economic systems, for example. Some scholars contacted as part of the information-gathering process for this paper were of the opinion that people may respond and recover effectively after a disaster, whereas physical infrastructure resists to a point and then fails:

> I think resilience can be applied to people, communities, institutions and the natural environment. With buildings, I am less certain. It is feasible to discuss reducing the vulnerability of buildings and other infrastructure, but they do not adapt per se. Reducing their [buildings] vulnerability is important to ensure their availability for people post disaster. To the extent they afford people the opportunity to adapt, they can be implicated in this context.[15]

The separation of people from 'structures'—that is, people can engage in adaptive behaviour but structures only can be adapted—sounds rather simplistic. While human beings should be at the centre of any resilience programme, they do not live in a vacuum but instead are part of systems that impact on losses and the locality's ability to deal with them.[16] Indeed, ecology literature is full of illustrations of societies, cities, communities and habitats, inter alia, as complex dynamic systems in the process of adaptation. If we accept that the definition of resilience incorporates the concept of adaptation, then structures as complex dynamic systems are also subject to the process of adaptation. Most scholars contacted as part of the information-gathering process for this paper believe that resilience should have a wider application. Viewing resilience from a broader standpoint ensures the capture of interrelationships and linkages between systems. Several disciplines, including human geography, human ecology and ecological economics, have hinted at parallels between ecosystem resilience and social resilience, yet it is not clear whether communities dependent on resilient ecosystems are themselves inherently more resilient (Agder, 2000). It may be a truism that resilient individuals may exist in non-resilient systems and resilient systems may contain individuals who are not resilient.[17]

> *If I am apathetic about disasters (which may hurt my ability to cope with a disaster after it occurs), I may not invest in disaster resistant construction. Also, if buildings crumble to the ground in an earthquake, a community's resilience may be jeopardised, as roads are impassable due to debris (which hinders emergency response and the delivery of aid).*[18]

A different emphasis in this respect is also called for in the following statement, which implies that resilience should not refer to people in systems so much as the nature of the system itself:

> *I have a different view from Ben Wisner and Terry Cannon or, at least, another way of seeing the same problem. They say in their recent contributions that only human vulnerability exists and that the buildings are indeed unsafe. It is an acceptable view. However, I prefer to say that the humans are in an unsafe condition because, for example, the buildings, or the crops are vulnerable too. Also I can say that a community is unsafe because its organisation is deficient, and its economy is weak, that is, it has no capability to absorb the impacts, it has no capabilities for recovering . . . because it has no resilience. . . . I do not know any approach at present which views these considerations in the same way.*[19]

However, systematic treatment of the concept of disaster resilience requires the delineation of vulnerability and resilience, which are to some extent blurring conceptualisation of the term. Understanding the constituent elements of both could aid our conceptualisation. The delineation also has an implication for disaster risk reduction delivery. Box 4 attempts to contrast the elements of vulnerability and disaster resilience—the major elements of the former being engineering and environmental sciences, and the major elements of the latter being medical and social sciences.

Box 4 Differences between vulnerability and resilience

Vulnerability	Resilience
Resistance	Recovery
Force bound	Time bound
Safety	Bounce back
Mitigation	Adaptation
Institutional	Community-based
System	Network
Engineering	Culture
Risk assessment	Vulnerability and capacity analysis
Outcome	Process
Standards	Institution

   The emphasis of human resilience is in the processes of enhancing human capacity to recover from a disaster within the shortest possible time with minimal or no outside assistance. This approach recognises that communities have certain levels of resilience built over centuries. Local adaptation strategies, culture, heritage, knowledge and experiences are the building blocks for boosting disaster resilience. The approach focuses on the quality of life of the people at risk and development opportunities to enhance resilience.

   The vulnerability approach places stress on the production of nature (Smith and O'Keefe, 1996) to resist the force, stress or shock resulting from a natural hazard. Engineering, guided by legislation, is at its nucleus. Also of paramount importance is the extent to which we must consider vulnerability and resilience in the political economy sense, in relation to human agency and world systems. Disaster management must address risk in the context of complex political emergency. However, this is beyond the scope of this paper.

Conclusion

The examination of resilience with respect to its definition, its relationship with vulnerability, and whether it applies to people or structures or both, reveals the need to tackle the philosophical questions that continue to blur the concept. Resilience is currently too vague a concept (Hanley, 1998) to be useful in informing the disaster risk reduction agenda.

   One primary challenge facing researchers is to achieve consensus on the definition. It has a variety of meanings: a metaphor related to sustainability; a property of structures; and a measurable quantity that can be assessed in field studies of socio-ecological systems (Carpenter, 2001). There is no problem with having multiple definitions as long as they do not cloud conceptualisation. Reaching consensus on conceptualisation is not an end itself, but has an implication for the modus operandi of disaster risk reduction delivery.

The argument presented in this paper suggests that disaster resilience could be viewed as the intrinsic capacity of a system, community or society predisposed to a shock or stress to adapt and survive by changing its non-essential attributes and rebuilding itself. This definition has consequences for disaster risk reduction and development practice. First, vulnerability reduction strategies are often orientated towards the creation of a human coping environment. Yet we have learnt that people want more than simply to attain the minimum standards associated with coping, meaning that there is a need to adopt resilience thinking that goes beyond vulnerability reduction. Second, development practitioners increasingly recognise that interventions are more likely to be successful, leading to genuinely positive impacts on human well-being, when the emphasis is on building local knowledge and augmenting existing capacity. This entails the identification of the essential and non-essential elements of communities and building on affirmative action rather than endless risk assessments and reactions to negatives. Third, project planning can learn from the resilience discourse in that it encourages us to prepare for resilience that is likely to be more than the sum of individual development activities and go beyond simply reducing aspects of vulnerability that may or may not have been possible to pinpoint.

It is important for the development and relief industry to identify and map resilience because many definitions clearly show that it is not equal to or the opposite of vulnerability. Furthermore, beyond being at times mutually exclusive concepts, different understandings exist of where and how we are working with human and/or structural resilience, at the individual or community level, and in relation to physical infrastructure and the structure of institutions. Arguably, this is far from just a matter of semantics, but rather a reflection of the diversity of meaning, understanding and presumably action in this field of research and development. Specifically, we might simplify this situation by considering the choices open to funding agencies to channel their resilience building support (read vulnerability reduction) into education, capacity building, psychosocial programmes and people-centred strategies, or more towards predetermined institutions and infrastructures. The increased awareness of resilience in disaster and development work does not necessarily mean the abandonment of support for infrastructure, but it does suggest the need to mainstream resilience building through people at the centre of disaster risk reduction and recovery.

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