
13 Vulnerability, poverty and sustaining well-being

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1. INTRODUCTION

A key tenet of sustainable development is that resources and opportunities should be widely shared in society. Where this fails to occur, individuals, communities and the ecosystems on which they depend are made vulnerable to external perturbations, to failures in governance, and to social crises. Thus development, if it is to be sustainable in the broadest sense, needs to address underlying vulnerabilities in society and vulnerabilities that are created by unsustainable resource use and exploitation.

The recognition that reducing vulnerability is a legitimate normative goal of sustainable development has become apparent in the context of global change. Vulnerability is an important characteristic of individuals, social groups and of natural systems. It is a state in which the ability of people in society to cope with environmental and other stresses is in question. The vulnerability of a group or individual depends on the capacity to respond to external stresses that may come from environmental variability and change, or from social upheaval and change. Vulnerability is made up of a number of components including exposure and sensitivity to hazard or stresses and the capacity to adapt. Thus, vulnerability does not exist in isolation from the wider political economy of resource use. It is caused by inadvertent or deliberate human action that reinforces self-interest and the distribution of power.

In this chapter we argue that recognizing the interdependencies between factors that create vulnerabilities is central to achieving sustainable development that ensures people's well-being. The concept of vulnerability is important in analysing, for example, the widely observed disparities between the rich and poor regions of the world and between the vulnerable on the one hand and those who are able to insulate themselves against shocks on the other. To this end the first section examines interdependencies of various social, economic and environmental processes that create vulnerabilities. The chapter then examines links between vulnerability, livelihoods and mobility, recognizing that, in order to achieve well-being for most, the multidimensionality of vulnerability and insecurity as it is experienced needs to be understood and confronted. Vulnerability is conceptualized in a variety of ways depending on disciplinary emphasis, ranging from the vulnerability of social and ecological systems to the vulnerability of individual livelihoods. While measuring vulnerability should be based on commonly agreed-upon thresholds of risk, danger and harm, different approaches are required in different contexts. The final section reviews some of these measurement issues and draws out future research trends.

2. THE LANDSCAPE OF VULNERABILITY

Vulnerability is common currency in debates on environmental risks and human development. In the past decade vulnerability is a term used by decision-makers in designing a response to both human-made and natural disasters. In the climate change arena, for example, countries are vulnerable to the impacts of climate change; some populations are exposed to risk associated with the potential spread of vector-borne diseases; and ecosystems and species are vulnerable to degradation or extinction. In the past decade many international development agencies have framed their development assistance around concepts of sustainable livelihoods, which incorporate the assessment of vulnerability (Eakin and Luers, 2006).

Analysis of vulnerability builds on theories of hazards and of development processes. These explain the processes that convert the distribution of resources in a society into a state which leads to powerlessness and risk of unsustainable outcomes, both in material terms and in terms of experience for sections of society. A theory of vulnerability further seeks to distinguish between environmental change as a human-induced element of risk and as a natural element of perturbation, renewal and change (Turner et al., 2003; Wisner et al., 2004; Adger, 2006).

Human well-being is vulnerable to disease, war and natural disaster, while economic structures promoting well-being are vulnerable to globalization, currency speculation and crises of confidence. But well-being is made up of the key components that have been articulated (by the Millennium Ecosystem Assessment, 2005, for example), as basic material needs, health, good social relations, personal security and freedom and choice. Many elements of vulnerability relate to the absence of well-being and security as well as unsustainable resource use, but equally emphasize the importance of empowerment and citizenship within well-being and sustainability.

Vulnerability thus encapsulates the susceptibility of groups or individuals to harm and to stress as a result of social change and environmental hazard and change. There are social dimensions to vulnerability and physical and ecological dimensions to vulnerability related to exposure to hazards and dimensions of risk. There are many conceptualizations of vulnerability (see Eakin and Luers, 2006; Heltberg et al., 2009), but there is common agreement that vulnerability is made up of a number of key components including exposure and sensitivity to hazard and the capacity to adapt. For any given social and economic system, the functional attributes are:

$$\text{Vulnerability} = f(\text{exposure, sensitivity, adaptive capacity})$$

Exposure encapsulates the likelihood of occurrence and the impact of an extreme event discrete phenomenon whose influence extends over a particular area with particular characteristics. The characteristics of exposure include magnitude, frequency, duration and areal extent of the hazard. Sensitivity is the extent to which a human or natural system can absorb impacts without suffering long-term harm or some significant state change. This concept of sensitivity, closely related to resilience, can be observed in physical, ecological and social systems. Adaptive capacity is the ability of a system to evolve in order to accommodate environmental hazards or policy change and to expand the range of variability with which it can cope.

Vulnerability is socially differentiated: virtually all natural hazards and human causes of vulnerability impact differently on different groups in society. Many comparative studies have noted that the poor and marginalized have historically been most at risk from natural hazards. Poorer households are forced to live in higher risk areas, exposing them to the impacts of earthquakes, landslides, flooding, tsunamis and poor air and water quality. This has particularly been shown in places everywhere undergoing urbanization processes and transitions (Pelling, 2003). Women are differentially at risk from many elements of environmental hazards, including, for example, the burden of work in recovery of home and livelihood after an event (Fordham, 2003). In many studies of the impact of earthquakes (including analysis of the Asian tsunami of 2004) women and other household dependants have suffered much greater mortality. Even for volcanic eruptions, which may seem indiscriminate in impact, significant social differentiation is important in specific circumstances: the ability of particular populations to recover from such events, and their networks and resources for coping are much diminished (Lavigne et al., 2008).

Flooding in low-lying coastal areas associated with monsoon climates or hurricane impacts, for example, are seasonal and usually short lived, yet can have significant unexpected impacts for vulnerable sections of society. Yet river flooding is an integral part of many farming systems as it provides nutrients in fertile floodplain areas. Hence natural hazards are often a disadvantageous aspect of a phenomenon at one point in time that is predominantly, and usually, beneficial. Impacts associated with geological hazards often occur without much effective warning and with a speed of onset of only a few minutes.

Vulnerabilities are becoming connected to global change in environmental and economic systems. While there is little doubt that the connections of globalization have brought about a revolution in knowledge, information and ideas, the negative consequences of capital flows and of the ability of both countries and transnational corporations to wield power at the global scale are also enormous. There are three major mechanisms of interdependence of vulnerabilities of ecosystems, people and places (see Adger et al., 2009). These are: the processes of global environmental change; economic market linkages; and flows of resources, people and information.

The first of the mechanisms for interdependence is the set of physical and biological processes that constitute global environmental change. Due to the global nature of environmental change processes accelerating in particular during the past century, impacts of environmental change in one locality have increased connection to regional and global systems. Second, economic market linkages are not only linked to global environmental change, but also can in and of themselves be drivers of interdependent vulnerabilities. The processes of global environmental change are indeed amplified by the social, political and economic trends of globalization. Global environmental change is driven in part by widening disparities between rich and poor both within and between countries. Liberalizing trade and integrating economies into world markets can make the incomes of the poor insecure, open to vagaries and price fluctuations, and ultimately more vulnerable when other shocks and stresses come along (Leichenko and O'Brien, 2008). A stark example is the global food price spike of 2008, which was driven by the interaction of economic and environmental factors: biofuel expansion limiting food supply; drought in major cereal-producing regions such as Australia; and speculation in agricultural com-

BOX 13.1 RELATIONSHIP BETWEEN MIGRATION AND VULNERABILITY

In the context of sustainability and environmental risks, migration is a livelihood adaptation strategy that allows households to manage risks at origin while improving their capability to cope with future stress (Tacoli, 2009; Schiller, 2009). Internal and international migration in every part of the world involves people seeking to improve their economic prospects and life chances and to reduce their vulnerability to a host of economic, social and environmental pressures. Migrants are motivated to improve their well-being through seeking education, better incomes, land and more stable social and economic conditions.

Moving from one place to another, however, is both costly and can increase exposure to additional livelihood risks. Financial, social and human capitals are all needed and this is a limited option for the poorest, unconnected, or non-working age populations. Further, migrating away from situations of risk does also not always lead to increased well-being at destination.

When migration is used as a coping mechanism in the case of displacement due to natural disasters, it has been shown that some populations end up moving to destination areas that themselves are significantly exposed to environmental hazards and environmental degradation, exacerbating their already vulnerable situation and lack of capacity to cope with additional risks (Black et al., 2013). In addition, vulnerability to environmental change may be inversely correlated with mobility, leading to those being most exposed and vulnerable to the impacts of climate change having the least capability to migrate.

modities markets (Piesse and Thirtle, 2009). The outcome of this food price volatility was most acutely experienced by urban consumers in the developing world and manifest in numerous social unrest and food price protests.

The third mechanism of interdependence of vulnerabilities across space and time is the closer connection between places in the world which has emerged through increased air travel and lower transport costs, and through movements of people and resources around the world. This has several dimensions, both positive and negative in terms of vulnerability. Demographic changes and migration produce new forms of sensitivity to risk, while providing some populations with new opportunities or access to resources that enable them to mitigate uncertainty. Increasing proportions of very old or very young people in a population, for example, change the nature of susceptibility to emerging diseases and pathogens. Further, the actual movement of resources for energy, food and primary production have both direct and indirect consequences.

The food eaten at dinner tables across the industrialized world, for example, has increasing environmental impact due to energy and fertilizer inputs, transport, and land use changes associated with new production. Agricultural and economic policies in one part of the world have direct consequences on producers in another part of the world, and the globalization of consumer tastes is now driving commodity production in agricultural regions. The consequences of the movement of materials round the world

are also increasingly apparent in bio-invasive species, demand for habitats and over-exploitation of species, and the emergence of new diseases (Adger et al., 2009).

One of the sustainability goals is to ensure a minimum level of well-being which, among other things, depends on people's ability to cope adequately with shocks and stresses that may plunge them into poverty. Ensuring well-being relies therefore on finding ways to reduce vulnerability by taking into account the independencies of global and local mechanisms as described above that create these vulnerabilities. This is particularly crucial for the poor and marginalized in many countries as they are least able to insure themselves against the ill-effects of global economic fluctuations and environmental risks (Wood, 2003).

3. LIVELIHOODS AND WELL-BEING

Over the past fifty years there have been spectacular successes in raising living standards in many parts of the world. Yet economic growth alone has not eliminated poverty anywhere. Deprivation of opportunity is still widespread, most obviously in the developing world where lack of absolute income for large numbers of people limits their health, material well-being and their freedom (Sen, 1999). Policies to promote livelihoods and well-being of populations in the developing world have been subject to various ideological fashions and beliefs. The Millennium Development Goals demonstrate that the livelihoods and well-being are driven by lack of opportunity, the absence of security, and by vulnerability to shocks. The Goals include focus on inadequate incomes, hunger, gender inequality, environmental deterioration and lack of education, health care and clean water (UNDP, 2003). Sen (1999) argues that the overarching goal of human development should be the ability for all people to realize their potential and that this is not fulfilled through economic means alone. In this context it is important to emphasize that poverty and vulnerability are not the same. Hence, while those who are poor are more likely to be vulnerable, the non-poor may also be vulnerable to a deterioration in well-being as a result of shocks.

Sustainable livelihoods and realized capabilities are the antonyms of vulnerability and poverty. The theory of entitlements as an explanation for famine causes was developed in the early 1980s (Sen, 1984) and displaced prior notions that shortfalls in food production through drought, flood, or pest were the principal cause of insecurity in agrarian societies. Essentially, vulnerability occurs when people have insufficient real income and access to resources, and when there is a breakdown in other previously-held endowments. Central to these ideas is the concept of human capability that explains the causes and persistence of poverty even in times of overall positive economic growth. Poverty is the lack of capability to live a decent life (Sen, 1999). Entitlements and capabilities are the actual or potential resources available to individuals based on their own production, assets or reciprocal arrangements. Entitlements are sources of welfare or income that are realized or are latent. They are 'the set of alternative commodity bundles that a person can command in a society using the totality of rights and opportunities that he or she faces' (Sen, 1984, p.497). Poverty, manifest for example through food insecurity, is a consequence of human activity, which can be prevented by modified behaviour, welfare institutions and by political interventions. Thus, vulnerability is the result of processes in which humans actively engage and which therefore preventable.

Analysis of entitlements, access to resources and welfare services in the face of stress and crisis is therefore a cornerstone of vulnerability theory. The need for livelihoods to be sustainable has been the focus of research and action on resource-dependent societies and economies. Within a particular vulnerability context (such as a combination of shifting seasonal constraints, short-term economic shocks and longer-term trends of change) individuals deploy different types of ‘livelihood assets’ or capital in variable combinations (Bebbington, 1999; Ellis, 2000). Understanding how institutions shape, and are shaped by, livelihood processes is also important in livelihood research (Ellis, 2000). It has been widely observed that social exclusion and exclusion from access to political decision-making are defining characteristics of communities and individuals that are vulnerable to environmental shocks (Kabeer, 2000).

Economic, social, demographic, political and psychological aspects of human vulnerability gain different prominence in different disciplines (shown in Table 13.1). In the context of disaster management human vulnerability is defined with respect to discrete events in nature or associated with technological failures (such as pollution incidents). Vulnerability is usually defined as an underlying condition, undermining people’s capability to respond adequately to the disaster, thus precipitating a negative outcome with respect to their well-being (Fekete et al., 2010). There has been much work in the field of change that seeks to illuminate vulnerability, but this is often focused solely on a social system or on the vulnerability of a species or ecosystem damage. Research that seeks to understand the vulnerability of systems, which includes both social and natural elements, is primarily concerned with the assessment of vulnerability of that system in its various

Table 13.1 Examples of how vulnerability is conceptualized across different arenas and disciplines

Vulnerability dimension	Traditions	Objectives
Vulnerability to hazards	Vulnerability and capacities	Identification and prediction of vulnerable groups to facilitate intervention
	Pressure and release	Structural analysis of underlying causes of vulnerability to hazards and risks, linking discrete risks with political economy of resources
Vulnerability of social-ecological systems	Vulnerability to global change	Explaining the vulnerability of coupled human–environment systems
	Climate change and variability	Explaining (and predicting) social, physical or ecological system vulnerability to (primarily) future risks
Vulnerability of livelihoods and poverty	Entitlements and capabilities	Developed to explain vulnerability to famine even in the absence of shortages of food or production failures
	Poverty and social exclusion	Explains why populations become or stay poor based on analysis of economic factors and social relations
	Assets and vulnerability	Explains vulnerability of populations to risks on basis of capital assets, from physical to social
	Sustainable livelihoods analysis	Explains the material outcomes and the ability to sustain these over time on the basis of capital assets

manifestations (Turner et al., 2003). Research in development economics perceives vulnerability as an outcome of a process of household responses to risk. Since the measurement of vulnerability at the individual level is extremely difficult, it is often reduced to one single causal factor. Alternatively, vulnerability of livelihoods and well-being is a condition that takes into account both exposure to risks and a household's defencelessness against deprivation, that is the external and internal aspects of vulnerability (Kamanou and Morduch, 2004).

4. VULNERABILITY AS A RELATIVE MEASURE OF DEPRIVATION AND SUSCEPTIBILITY TO HARM

There is no straightforward way to measure vulnerability. Measurement of vulnerability inevitably needs to reflect social processes, environmental perturbations and material outcomes: it is not easily reduced to a single metric. While it is easy to recognize personally the feeling of vulnerability and perhaps to grasp the outcome of vulnerability in others in a similar situation, the translation of this complex set of parameters into a quantitative metric has been argued to reduce its impact and hide its complexity (Heltberg et al., 2009). There have been significant advances in methods in vulnerability analysis towards measures that both incorporate human well-being and recognize the relative and perceptual nature of vulnerability.

In the quantitative social sciences, particularly in economics, there have been attempts to develop metrics for vulnerability that are comparable across time and location to make them more tractable (Kamanou and Morduch, 2004; Heltberg et al., 2009). Much of the research is concerned with vulnerability to poverty and, in the search for tractability, often focuses on consumption as the key parameter. But since societies are vulnerable to multiple stresses and vulnerability is manifest in various outcomes, there are, in effect, different thresholds on vulnerability informed by values and social context. There are therefore various ways of measuring vulnerability that provide complementary quantitative and qualitative insights into outcomes and perceptions of vulnerability. While quantitative measures allow comparison of relative vulnerability across circumstances, these do not substitute for the narrative richness of stakeholder-led or qualitative assessments of vulnerability in places and contexts.

Households capable of deriving an adequate living from their assets or the transient poor can all be vulnerable to poverty as a result of shocks to those livelihoods. Households that already face capability constraints due to structural factors such as landlessness or contextual factors such as the lack of social welfare from government or community, are also vulnerable to a further decline in welfare through the exposure to shocks such as failing local markets or illness within the family. Vulnerability is, however, also the outcome of a shock and social exclusion by limiting the capability to deal with subsequent shocks. The degree to which a household is vulnerable, and continues to be so, is a function of the risk factors, both internal and external to the household, and their capability (determined by asset portfolio) to respond to these risks. The key sources of risks to sustainable livelihoods are outlined in Table 13.2, which summarizes the types of risk arising from changing social and environmental conditions and how these can affect access to assets and resources.

Table 13.2 Types and sources of risk to sustainable livelihoods

Sources of livelihood	Environmental risk	Social risk		Economic risk	Conflict
		Government	Community		
<i>Human capital</i> Labour power, education, health	Disease epidemics due to poor sanitary conditions, AIDS	Declining public health expenditures, user charges, declining education expenditures	Breakdown in community support of social services	Privatization of social services, reduction in labour opportunities	Conflict destroys social infrastructure and restricts mobility
<i>Financial and natural capital</i> Productive resources and capital resources	Drought, flooding, land degradation, pests, animal disease	Land confiscation, insecure tenure rights, taxes, employment policies	Appropriation and loss of common property resources, increased theft	Price shocks, rapid inflation, food shortages	Conflict leads to loss of land, assets, and theft
<i>Social capital</i> Claims, kinship, networks, safety nets, common property	Recurring environmental shocks, breakdown ability to reciprocate, morbidity and mortality affect social capital	Reduction in safety net support (school feeding etc.)	Breakdown of labour reciprocity, breakdown of sharing mechanisms, stricter loan requirements, lack of social cohesion	Shift to institutional forms of trust, stricter loan collateral requirements, migration for employment	Communities displaced by war, theft leads to breakdown in trust
<i>Sources of income</i> Productive activities, process and exchange activities, other sources of employment, seasonal migration	Seasonal climatic fluctuations affecting employment opportunities, drought, flooding, pests, animal disease, morbidity and mortality of income earners	Employment policies declining subsidies or inputs, poor investment in infrastructure, taxes		Unemployment, falling real wages, price shocks	Marketing channels disrupted by war

Source: Adapted from Frankenberger et al. (2001, p. 77).

Methods for vulnerability assessment in the context of development assistance, and famine early-warning systems have been developed and used across the developing world (Stephen and Downing, 2002). Local and national indicators seek to overcome issues of validation and triangulation of data to derive more robust measures for both policy analysis and intervention (Yohe and Tol, 2002). A common critique of indicator research, particularly focused on country-level analysis, is that it fails to account for sub-national spatial and social differentiation of vulnerability, and local conditions mediate the capacity to adapt. Spatial mapping of elements of vulnerability allows both identification of

localities where vulnerable populations reside or are exposed, as well as promoting planning for resilience (for example, Cutter et al., 2008).

The implications of the relative nature of vulnerability and its manifestations in perceptions of insecurity are that any generalized method to measure vulnerability needs to incorporate an objective material measure of vulnerability but also to capture relative vulnerability, inequality in its distribution and social status. The vulnerability of any population is not simply a matter of the number of people who are vulnerable through not having entitlements to resources or not being exposed to stresses associated with environmental change. Rather a generalized measure needs to account for the severity of the vulnerability and the measure needs also to be sensitive to redistribution of risk within vulnerable populations. Ideally a measure of vulnerability, therefore, requires certain characteristics. These necessary characteristics of a measure are familiar in micro-economics and social statistics, for example in the measurement of poverty, because they also deal with issues of well-being, relative versus absolute change and transient versus persistent states.

Luers and colleagues (2003) directly address many of the dilemmas of measuring vulnerability. Their approach represents a state of the art. In recognizing many of the constraints they make a case for measuring the vulnerability of specific variables: they argue that vulnerability should shift away from quantifying critical areas or vulnerable places towards scale-neutral systematic measures. They argue for assessing the vulnerability of the most important variables in the causal chain of vulnerability to specific sets of stressors. They develop generic metrics that attempt to assess the relationship between a wide range of stressors and the outcome variables of concern (Luers et al., 2003). In their most general form:

$$\text{Vulnerability} = \text{sensitivity to variability} / * \text{ prob. of exposure to stress state relative to threshold}$$

Whatever the generalized form of vulnerability measure, there is an inescapable need for a threshold of risk, danger or harm. The measures of vulnerability severity discussed above involve a measure of well-being. But this could be measured in a number of different ways. Objective material measures could be used, such as indicators of mortality, income, wealth, or freedom from crime or access to education, depending on the nature of the vulnerability being measured. In addition vulnerability as experienced could be measured directly through indicators of perception, as used in social psychology.

The problem of course is that any meaningful threshold is likely to be highly heterogeneous. As Watts and Bohle (1993) and Cutter (2003) argue, vulnerability is manifest in specific places at specific times: hence the determination of the threshold level of well-being that constitutes the threshold is not simply a proportional measure, the same for all sections of society. In addition, the choice of thresholds is based on values and preferences and hence is both institutionally and culturally determined. The measurement of vulnerability inevitably requires external judgements and interpretations of the thresholds of acceptable risk. This characteristic of the inescapability of a vulnerability threshold needs to be both made explicit and embraced in vulnerability methods.

5. CONCLUDING REMARKS AND FUTURE PROSPECTS

There are key linkages between livelihoods, sustainability and vulnerability. First, due to the complexity of the future (for example, trends in environmental change, technologies and other social and demographic processes), individuals and social systems are always vulnerable to surprise and susceptible to unforeseen consequences of action (Cutter, 2003). While policy-makers always express surprise at events, many of these are predictable or at least imaginable. Yet vulnerability persists, due both to inherent unpredictability in some physical systems, but also because of individual and collective blocks to perceiving certain risks. Thus technological risks that create new vulnerabilities (from nuclear power to genetically-modified agricultural crops) are ignored in the name of progress (see also Chapter 6). If a goal of sustainable development is to eliminate risks to the most vulnerable, then application of a precautionary principle should be central to decision processes.

The second area of linkage between sustainability and vulnerability, and the major focus of this chapter, is the continuing failure of sustainable development to meet goals of widespread access to minimum levels of well-being for all. We have argued here that the distribution of income and access to resources represent fundamental determinants of capability and vulnerability. Evidence that inequality plays a role in exacerbated environmental degradation is compounded when wider conceptions of marginalization and resilience are included.

The changing nature of access to resources and thus well-being and the impacts of global economic change potentially undermine social resilience and create circumstances to which the only response of the vulnerable is resistance. Social resilience is enhanced or undermined both by the formal institutions of the state and the legal framework of property rights, and by the outcomes of democratic governance. There is much rhetoric on the need to reduce vulnerability in the context of global disasters and the threats of climate change. Yet the consequences of actually implementing action that puts vulnerability centre stage are profound, and, in our view, explain why sustainable development for the marginalized and vulnerable who bear the brunt of environmental degradation is a moral and political imperative.

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