

# Towards an Interdisciplinary Conceptualisation of Vulnerability

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## ABSTRACT

**Each discipline uses uncertainty in different ways. This paper reviews the range of definitions and methodologies used by researchers to approach vulnerability in the search for an interdisciplinary conceptualisation. Two themes (poverty, exclusion and marginalisation on the one hand, and society–environment interactions on the other) are used to explore the authors' conceptualisation of vulnerability. The paper points towards possible convergences of these approaches. Copyright © 2005 John Wiley & Sons, Ltd.**

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## INTRODUCTION

We live at a time in history when thinking about vulnerability is unavoidable. Have we, indeed, ever been so vulnerable? Since 9/11, it has been clear that all, even the economic and political superpower of the United States of America, are vulnerable. Christmas 2004 brought home the message once again, as the Indian Ocean tsunami brought death and destruction to hundreds of thousands – mostly poor – families in Asia and Africa. This dramatic pair of events humbles the most

ambitious of social scientists as they seek an analytical separation of the roots of uncertainty in the contemporary world. Both nature and culture are inextricably bound in the causal nexus of what has been called the 'risk society'. As scientists from many disciplines reach for new concepts to cope with these realities, vulnerability has acquired a prominent place in academic thinking.

Today's vulnerability is so all-encompassing that it involves every dimension of our lives. Vulnerability did not originate in the geopolitical context of the war on terror; on the contrary, the war on terror is a consequence of a risk situation which has generalised vulnerability as never before in the history of the world.

In this situation of increasing risk, with ever-present hazards and with daily recognition of our impotency to control them, the sense of oppression and anxiety – signs of the contemporary world – increases. Markets are vulnerable, institutions, cities, populations, specific demographic groups, genders, ethnic groups, places, regions, nations: all can be vulnerable. The 'country risk' of the financial world has come to determine, together with other financial and economic indicators, the possibilities of investment in a country, producing consequences felt in varying degrees in the whole society. Public safety in large Brazilian cities, such as Rio de Janeiro and São Paulo, has reached extremes of calamity, where no one feels safe. Traffic, violence, social inequality, exclusion – all are elements which bring risk and vulnerability to the centre of discussion.

This social situation, at the national and global levels, is made worse by an equally present environmental deterioration. At all scales, environmental risks, and the vulnerability of ecosystems or of human beings to environmental dynamics

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and consequences, promote or aggravate social vulnerability. Hazards, both natural (urban flooding, landslides, violent storms) and technological (soil contamination from chemical products, industrial accidents, radiation), as well as risks from pollution and degradation themselves, such as heat islands, thermal inversion, risks to health and to life itself, multiply. They invade not only cities, but also vast rural areas, such as the risk of contamination from agricultural chemicals, soil erosion, and the as-yet-unmeasured risks of transgenics – not to mention global environmental change, with consequences still not well understood.

This whole range of processes, dynamics and events has been studied by many researchers. The use of the category 'risk', together with that of 'hazard', represents an important perspective in sciences such as Geography, Economics, Psychology, Earth Sciences, Health Sciences, Engineering and, more recently (but not with less intensity), in Sociology, Law and Bioethics. These studies have contributed in different ways to the predictive capacity of the consequences and impacts of social and environmental change.

As an analytical category, these sciences use risk in different methodological-theoretical frameworks and for different problems. Vulnerability, as an idea, is nearly always present. However, its incorporation as a concept is more recent, gaining importance gradually over time. The difficulty which must be faced, as is true of other concepts in the human sciences, is to go beyond common sense to a conceptual ontology. Hogan (2002) called attention to this need:

'To add more dense meaning to concepts borrowed from non-scientific discourse and to connect them to wider theoretical frameworks is unavoidable. *Vulnerability* and risk are concepts of this type. They have been used by students of the environment because they have a resonance that our traditional vocabulary does not possess. In particular, they allow us to associate natural and social factors, a requirement of environmental realities.' (Hogan, 2002: 176) [our translation from the original Spanish]

The principal objectives of this paper are to gather elements from different approaches, concerning the use of the term *vulnerability*, and to outline a conceptual discussion which might produce more robust theory. This endeavour

does not seek conceptual unity, but intends to map vulnerability as it is used in these different orientations to guide our own methodological and theoretical thinking on the study of the city and its environment. This paper continues our efforts to bring greater conceptual clarity to studies on risk, beginning with the concepts of risk and hazard among geographers (Marandola Jr. and Hogan, 2004a), then extending to a more wide-ranging evaluation of tendencies and approaches to the concept of risk (Marandola Jr. and Hogan, 2004b) and an attempt to locate the disciplines of Geography and Demography in the study of risks and vulnerabilities (Marandola Jr. and Hogan, 2005).

We will not focus on approaches according to scientific disciplines. Rather, we try to outline the studies on the basis of two major themes, locating in the interior of each of them various tendencies. The first theme is that of *poverty*, *exclusion* and *marginalisation*. The second is the *environment*. We are concerned to identify general contexts and concerns and their applications and theoretical import, without pretending to exhaust all possibilities. Finally, we seek to synthesise preliminary reflections on the possibilities of these theoretical bases for environmental studies which propose a wide-ranging view of environment and society, on the basis of a trans-scalar and multidimensional vision (Marandola Jr., 2004), in the direction of a possible convergence of these approaches.

#### VULNERABILITY: A NEW CONCEPT FOR THINKING ABOUT POVERTY?

In all of the processes and dynamics mentioned above, representative of the present state of generalised vulnerability, we especially noted the social component, or, in the expression of Vera Telles, the 'social question' which underlies each of these phenomena (Telles, 1996). Social debates aligned to critical theory have been a principal matrix of thought on the 'social question', searching for an understanding of the functioning of capitalist class society which would promote social transformation.

Over the last several decades, various tendencies have held sway as the dominant analytical approach. However, the major concern was always the condition of those who did not own the means of production (to use the classical

Marxist expression). These different perspectives brought, besides a tradition committed to political and ideological involvement, a succession of concepts which functioned as *idées-forces* in the treatment of inequalities deriving from the perverse model of the capitalist system. Marginality, dependency, exclusion, exclusion/inclusion, segregation and apartheid were some of the concepts which were widely discussed and used by these researchers, almost always seeking to explain the complex reality involved in contemporary poverty.

The study of social inequality is based, then, on the reading of class society, where different social segments have different life opportunities.

'... socioeconomic segmentation implies something more than mere cultural distinctions or functional distributions, since hierarchies and asymmetric relations are important. This means that certain population segments – specifically those situated in the upper levels of the socioeconomic hierarchy – have social advantages (they have assets) and others – those situated in the lower levels of this hierarchy – face social disadvantages (they lack assets).' (Rodríguez, 2000: 12) [our emphasis; our translation from the original Spanish]

This reading of social advantages and disadvantages, in the form of assets and opportunities, is the basis of a new way of treating the topic under discussion: *socioeconomic vulnerability* and its correlate, *sociodemographic vulnerability*. This approach has been promoted, conceived and applied in the Latin American context by researchers of the Economic Commission for Latin America (ECLAC), with various studies undertaken in the region.

Vulnerability is associated with the social disadvantages<sup>1</sup> which simultaneously produce and are reflections and products of poverty. Rodríguez (2000) emphasised this relation:

'... poverty in any of its manifestations (precarious living conditions, unsatisfied basic needs, insufficient income for basic consumption) constitutes a factor of social disadvantage, because, since the beginning of their lives, the poor are limited in their access to the circuits and institutions from which cultural resources and information flow, they do not have the resources to engage a process of accu-

mulation and their very biogenetic make-up is submitted to pressures, exigencies and adversities.' (Rodríguez, 2000: 13) [our translation from the original Spanish]

Disadvantages are understood as social conditions which negatively affect people, communities or places. Rodríguez noted that they correspond to less access – because of knowledge or availability – and capacity to manage resources and opportunities that society has for the development of its members. There is, then, a direct relationship between these disadvantages (which originate from larger social structures) and poverty and vulnerability.

Vulnerability is, then, the concept of the hour, with the possibility of:

'... more dynamic treatment, with which it becomes possible to anticipate the risk of damage or of paralysis as well as – on the opposite side – the potential of strengthening or adaptation.' (Rodríguez, 2000: 14) [our translation from the original Spanish]

The incapacity or inability to manage a set of assets or opportunities, or the inexistence of such in a specific social context (in a situation of unemployment or chronic illness, for example), is part of the vulnerability of certain population segments (ECLAC, 2002a).

The family is an important cell of microsocial dynamics, where reactive strategies and mobilisation of potential assets and opportunities can contribute to diminishing vulnerability. It is in this sphere that demographic characteristics will be more important (although they are also important in the larger social context). Demographic traits constitute a situation which is the current manifestation of individual and family decisions and behaviours consolidated in the past, influenced by the context and by personal biographies of family members. This set of sociodemographic elements, when linked to social disadvantages, is called *demographic vulnerability*, based on the idea that socioeconomic groups possess distinct demographic dynamics and characteristics, allowing a closer examination of the meaning and of the more pragmatic and operational processes of social disadvantages and of vulnerability (Rodríguez, 2000).

Vulnerability, then, is understood as the lack of adjustment between assets and the structure of

opportunities, a structure which is a result of the capacity of social actors to take advantage of opportunities in other socioeconomic settings and to improve their situation, avoiding deterioration in three main areas: personal resources, rights and social relations (Kaztman, 1999).

Although intimately related, citizenship is not given much attention as a central concept in this research. Other researchers, however, who have incorporated vulnerability into the study of social inequalities, have given it a central position, especially in the field of rights.

The discussion of citizenship evolved from the 1970s onwards together (although involving several different traditions) with discussions of 'social questions'. Citizenship itself was one of these major questions. The perspective of citizenship under discussion links it to access to rights. This means that 'citizenship becomes vulnerable in its emancipatory impulses' (Hopenhayn, 2002: 9) as a result of the economic, political and cultural vulnerability of peripheral countries like those of Latin America.

Hopenhayn examined this idea of 'vulnerabilized citizenship' in Latin America from a wider perspective of both vulnerability and citizenship. For this author, the relationships between citizenship and the state have been severely shaken. This has encouraged the withdrawal of citizenship from public space to the private sphere, due to the difficulty for the common citizen in reconciling individual preferences with the interests of a wider collective project. Withdrawing to the private sphere, citizenship can rescue some shreds of autonomy, principally related to local empowerment or to economic freedom (Hopenhayn, 2002). This perspective is echoed by Marston and Mitchell's notion of 'flexible citizenship', and the shifts in rights and responsibilities resulting from state action. These authors emphasise citizenship formation – 'citizenship as it is actually constructed in specific periods and places' (Marston and Mitchell, 2004: 101). This approach leads to the recognition that the citizenship process is not one of continuous, uninterrupted expansion – as classical theories assume – but that it 'may also snap back or shift shape completely' (Marston and Mitchell, 2004: 101).

Thus citizenship, as a 'product of the interaction of civil society and the state', is subject to changes resulting from all sorts of pressures on

the contemporary state. Both geographical scale and socio-spatial organisation are seen as impinging on citizenship formation. A poignant example, provided by Stewart (2005), is the 'new apartheid' suffered by asylum seekers in the UK. The reduction in rights through such mechanisms of exclusion as deportation adds a new layer of vulnerability to that experienced earlier in the places from which they fled.

In this new *locus* of citizenship, the individual must maintain a balance between the formal and the informal system, between the sought-for freedom and the insecurity that is the fruit that stems from the total absence of protection. Left to the mercy of the 'market' of opportunities which the ECLAC demographers identified, the citizen is without rights and is forced to negotiate assets and empowerments, according to his or her management capacity. In this situation, Hopenhayn (2002) identified one of the major axes of the vulnerability of citizenship: the lack of the feeling of belonging, which is pulverised and fragmented through the breaking of the links between state, citizenship and identity.

This vulnerability is expressed, therefore, in the restriction of rights, whether economic, political or social. It is here that poverty and exclusion come in: the restriction of the right to dignity, to health, to decent housing, to be respected, to political participation, to be represented, to be heard, to speak. It is also here that another crucial problem in Latin America enters: racial discrimination.

'Discrimination is historically connected to what has been called the "negation of the other." Ethnic and cultural discrimination has been accompanied by socioeconomic and political exclusion of ethnic groups, especially indigenous groups and Afro-Latin Americans.' (Hopenhayn, 2002: 11) [our translation from the original Portuguese]

Social exclusion is linked to both demographic factors and to those resulting from the processes of development, as well as to transformations in the world of work. Hopenhayn pointed out that the continual negation of the culture and identity of the other facilitates the acceptance of socioeconomic exclusion. This is an unavoidable outcome of the changes that flow from modernisation (the exclusion of indigenous populations in Latin America is a flagrant example). Thus,



socioeconomic, ethnic and cultural vulnerabilities are tragically associated, and ethnic minorities are afflicted by superimposed vulnerabilities. They are among the most vulnerable groups in terms of unsatisfied needs, political exclusion, social marginality and cultural discrimination. But the excluded are not only the poor, as Brown (2005) illustrates in his analysis of the gay and lesbian atlas of the US. He warns that demographers and geographers must be aware of the consequences of their methodologies: 'scale-jumping' has serious consequences for defining vulnerability of specific areas. While it is clear that scales frame the visibility of vulnerable groups, they may also produce invisibility. The option of looking at places or polygons must account for the consequences of what is revealed.

Kowarick (2002) adopted a similar approach when he discussed the vulnerabilities of urban Brazil. He also treated the notion of vulnerability associated with restrictions on access to the 'goods' of citizenship, principally those related to employment, to services of social protection or to the increase in criminal violence. These phenomena have been identified by Kowarick as factors contributing to the 'fragilization' of citizenship, understood as:

'... the loss or absence of rights and as a precariousness of collective services which guaranteed a minimal level of public protection for groups without private resources – money, power, influence – to confront uncertainties in the *metropolises of industrialized underdevelopment*.' (Kowarick, 2002: 15; see also Kowarick, 1993) [our translation from the original Portuguese]

The increase of urban vulnerability in Brazil can be seen in phenomena like the growth of squatter settlements and the impoverishment of the population, which reflect the perverse economic situation regarding wage levels, unemployment, informal employment and irregular work, resulting in greater numbers of persons living below the poverty line.

This reading is based on a schematic model which includes economic and social axes and distinguishes four zones: *integration*, which is characterised by a range of collective and legal guarantees regarding work and stable, solid social relations; *vulnerability*, which includes precariousness in work and the fragilising of

primary relations; *assistance*, which reveals a situation in which various forms of public subsidy become indispensable for the maintenance of social and economic ties; and *unconnectedness*, which means unemployment and the loss of roots in the sociability of daily life (Kowarick, 2002). In this scheme, then, vulnerability refers, similarly to the ECLAC (2002a,b) position, to a declining position in the social pyramid. To be vulnerable, then, may be understood as being susceptible to entering the zones where public subsidy is indispensable and unemployment probable.

Kowarick, however, considered some different spheres of vulnerability from the ECLAC demographers, who focused primarily on sociodemographic vulnerability. The author came closer to Hopenhayn in his emphasis on seeing vulnerability as a consequence of social and economic uprooting, associated principally with forms of irregular, informal, intermittent or occasional employment. These forms of employment weaken the bonds of primary sociability (family, relatives, neighbourhood, community organisations and the world of work itself), bringing, obviously, direct consequences for citizenship, access to rights and exposure to risks of every kind.

These approaches, as mentioned above, place the emphasis on empowerment (Watts and Bohle, 1993). This focus is directly linked with the theories of the economist Amartya Sen on entitlements, functionings and the expansion of capacities (Sen, 1981, 1993, 1999). Sen conceived human life to be a combination of various functionings and capacities for self-realisation, understanding human freedom as the central characteristic of life (Sen, 1993). Thus, to empower and to entitle a person involves giving him the capacity to exercise his freedom and to expand his capacities. The opposite is vulnerability, that is, the reduction of capacities and of the 'power' of action and realisation.

This focus had its origin in the classic studies of Sen (1981) on hunger, and did not have, in the beginning, any direct link with the notion of vulnerability. This is one of the notions which, even without explicit mention in his works, resonate from his theories.<sup>2</sup>

Watts and Bohle (1993) are among the authors who have related Sen's concepts to the discussion of vulnerability. The authors had as their focus

the study of hunger, but, as geographers, sought to discuss theoretically the spaces of vulnerability on the basis of its causal structure. Watts and Bohle (1993) sought to relate the historical aspects which characterise poverty and hunger with social, political and economic aspects, trying to find the structure which shapes spaces of vulnerability. Hunger is understood as the collapse of the distribution of entitlements and of basic needs in a society. In addition to this, in this causal structure the authors emphasised the failure of empowerment, often manifest in the failure of productive property systems, as well as social classes (power and property), which in the case under discussion is quite significant.

On the basis of these considerations, the authors gave their definition of vulnerability:

'Vulnerability can be [...] 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. minimize destructive consequences) via private and public means.' (Watts and Bohle, 1993: 45–6)

This focus on exposure, capacity and potentiality points to three kinds of risk: (1) risk of exposure to a crisis; (2) risk of incapacity to deal with the stress, crisis or shocks; and (3) risk of severe consequences, in the form of crises, risks or shocks. This framework has proved useful in Gould's analysis of AIDS in Africa. Migrants, for example, were less exposed, since they were more likely to abstain from sex; to use condoms; and to avoid prostitutes (Gould, 2005). Findlay (2005), in his discussion of 'spatial vulnerabilities', goes beyond these three moments of vulnerability, pointing to the convergence of space and time. The globalisation of risk took the consequences of the 2004 tsunami to all points in the world,<sup>3</sup> with the same global reach as 9/11. Vulnerability has changed because space has changed.

The Watts and Bohle definition attests to the influence of Sen's concepts and the validity which his theories possess for studies of socio-demographic vulnerability. The ECLAC group mention entitlement theory (Kaztman *et al.*, 1999), but give greater emphasis to the structure of opportunities and assets which, in a certain way, could be understood as Sen's capacities and functionings. We believe that their use

could enrich earlier approaches, providing a more consolidated theoretical base, with multiple interfaces already explored by different sciences.

Furthermore, discussions of citizenship and social justice should occupy a central position in these debates, becoming the most relevant foci of these theories. Most studies have focused on vulnerability in an exclusively negative way. They also do not incorporate the environmental dimension: especially in large cities, social and environmental vulnerabilities are very often superimposed. In other words, persons and areas vulnerable from a social or sociodemographic point of view, in the majority of cases, are also vulnerable in the environmental sense. This observation leads us to search for more encompassing perspectives which incorporate both social and environmental dimensions, as well as others which might be relevant to the concept of vulnerability. Those researchers who have worked with the environment have tried to seek this focus.

#### FROM NATURAL CATASTROPHE TO 'GLOBAL ENVIRONMENTAL CHANGE' SCIENCE: THINKING ABOUT SOCIETY–ENVIRONMENT RELATIONSHIPS

Among the most notable characteristics of our times is the importance which environmental dynamics and phenomena have taken on, not only in everyone's day-to-day life, but also in the world's political and economic agenda. From the world of ecologists and activists, the tragic consequences of the inadequate relationship between society and environment have assumed global dimensions. In this setting, the notion of vulnerability also appears with great force.

At first, especially in the decades following the Second World War, the environmental phenomena (then treated as natural) whose social implications came to the attention of scientists were limited to catastrophes or natural disasters. Phenomena such as earthquakes, floods, landslides, snow storms, volcanic eruptions, tornados, hurricanes and tropical cyclones were studied from various perspectives. For geographers these events were studied as natural hazards, with a specific risk of occurrence, 'producing' disasters proportional to the dimensions and intensity of these dangers. Interest did not lie only in the bio-

physical dimension of the phenomenon, but also in the responses and human adjustments (individual, collective and governmental) to these events (Hewitt and Burton, 1971; Burton *et al.*, 1978; Smith, 1992).<sup>4</sup> Sociology, in turn, also has a tradition of studying these disasters, taking into account both social and historical determinants of their occurrence, and the consequences and mitigating actions in socio-political and economic spheres (Quarantelli, 1994).<sup>5</sup>

Over the decades, these studies have undergone several changes of emphasis, seeking to incorporate more holistic and complex perspectives, in order to understand the intricate network of human-physical-social relationships that underpin the genesis of disasters. In addition to this, among the events studied, phenomena of technological origin were incorporated, such as chemical disasters, industrial contaminations and nuclear accidents, as well as eminently social phenomena such as hunger, poverty and violence (Jones, 1993).

Catastrophes which at first attracted the attention not only of scientists to environmental problems, but also of the public, also became the catalyst to the social sciences taking an interest in environmental events, by showing how social and environmental questions could not be separated. Thus, natural events and disasters became recognised as 'important elements for the analysis of the vulnerability of specific populations' (Hogan, 2002: 175). But this quote begs the question 'How?'

Cutter (1996) evaluated the incorporation of vulnerability in this research, seeking to critique studies of natural hazards which in general did not incorporate the discussion of development and poverty in their analyses, and did not mention causes of social vulnerability in disasters. If, on the one hand, studies of natural hazards produced a wide range of information on response to, adjustment and perception of risk and hazard, searching for alternatives for the management, prediction and planning of hazards and their damage, on the other hand, they did not discuss in any detailed way capacities or possibilities of protection. The analysis of events was external, passing directly to issues of perception, with no discussion of the social processes directly involved not only in the genesis of disaster, but also (above all) in actions taken to reduce disaster risk.

It is here that vulnerability appears as a concept that permits this more complex analysis. Studies of hazards and disasters in Geography, then, begin to include factors ranging from the biophysical and social processes of an event, to environmental, social and individual consequences, as well as individual, collective and governmental decisions, choices and adjustments.

These changes began to occur in the 1980s, accelerating in the 1990s. However, the adoption of the concept of vulnerability does not obey any order, producing a range of more or less related definitions and applications. Cutter listed at least 18 of them, which permits us not only to see the multiplicity of applications and nuances, but also a certain evolution, pointing to the discussions found in the scientific literature (Table 1).

We find positions directly linked to natural phenomena, concepts strictly connected to social explanations, and those which try to balance these two dimensions. Some are linked only to the study of hazards, while others create a certain confusion between the concepts of risk, hazard and vulnerability. Nevertheless, we can clearly see that the more recent definitions seek to include the largest number of elements, recognising the multidimensionality of reality and the multidimensionality of vulnerability itself, which cannot be restricted to any one field.

Especially in the 1990s, then, interest in the populations which suffer these events grew: not only regarding populations' perception of the event, but the whole drama which they face. According to Blaikie *et al.* (1994: 3), there was a concern to avoid '[...] this rather artificial separation between people at risk of natural hazards and the dangers inherent in "normal" society.' The authors sought to analyse disasters without separating them from the daily life of people and of the risks these people face throughout their lives.

'It [this approach] seeks the connections between the risks people face and the reasons for their *vulnerability* to hazards. It is therefore trying to show how disasters can be perceived within the broader patterns of society, and, indeed, how analyzing them in this way may provide a much more fruitful way of building policies that can help to reduce disasters and mitigate hazards.' (Blaikie *et al.*, 1994: 3)

Table 1. Selected definitions of vulnerability.

Gabor and Griffith (1980)	Vulnerability is the threat (of 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.
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).
UNDRO (1982)	Vulnerability is the degree of loss to a given element or set of elements at risk resulting from the occurrence of a natural phenomenon of a given magnitude.
Susman <i>et al.</i> (1984)	Vulnerability is the degree to which different classes of society are differentially at risk.
Kates (1985)	Vulnerability is the 'capacity to suffer harm and react adversely'.
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 materials releases.
Bogard (1989)	Vulnerability is operationally defined as the inability to take effective measures to insure against losses. When applied to individuals, vulnerability is a consequence of the impossibility or improbability of effective mitigation and is a function of our ability to select the hazards.
Mitchell (1989)	Vulnerability is the potential for loss.
Liverman (1990)	Distinguishes between vulnerability as a biophysical condition and vulnerability as defined by political, social and economic conditions of society. She argued for vulnerability in geographical 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. are vulnerable to hunger); and it is a relative term that differentiates among socioeconomic groups or regions, rather than an absolute measure of deprivation.
Dow (1992)	Vulnerability is the differential capacity of groups and individuals to deal with hazards, based on their positions within physical and social worlds.
Smith (1992)	Risk from a specific hazard varies through time and according to changes in either (or both) physical exposure or human vulnerability (the breadth of social and economic tolerance available at the same site).
Alexander (1993)	Human vulnerability is a function of the costs and benefits of inhabited areas at risk from natural disasters.
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 hazards of place (risk and mitigation) with the social profile of communities.
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 <i>et al.</i> (1994)	By vulnerability we mean the characteristics of a person or 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 is put at risk by a discrete and identifiable event in nature or in society.
Bohle <i>et al.</i> (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.
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 hazards.

Source: Cutter (1996: 531–2).



This notion of vulnerability relocates the focus from the biophysical dynamics of the event to the social, economic and political production of the environment, central elements in the causal structure of determining who is vulnerable to these events. In view of this, Blaikie *et al.* understood

'by "vulnerability" [...] the characteristics of a person or 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 which determine [...] the degree to which someone's life and livelihood is put at risk by a discrete and identifiable event in nature or in society.' (Blaikie *et al.*, 1994: 9)

These authors seek to change the analysis of disasters to being something that is a normal part of daily life, something inevitable and inescapable. The idea of vulnerability is useful precisely because it permits studying dynamics which are beyond the circumscribed space of the disaster itself, the tendency in vulnerability studies that focus on natural catastrophes. Moving away from this focus on the strict biophysical dynamics, the proposal is to focus on the whole range of economic, political and social processes involved in the disaster, with the focus on the vulnerability of populations.

These features of the approach are clear in the recently published new edition of Blaikie *et al.*'s book, ten years after the first edition and 15 years after discussion began among the authors (Wisner *et al.*, 2004). In the new edition, the authors, while maintaining their earlier definition of vulnerability, recognise that in the first edition of the book it appeared much more as a notion than as a well-defined and elaborated concept. In the 1994 book the authors used two pages to answer 'What is vulnerability?' In the new edition this discussion is much more elaborate, and the authors take account of the debate of recent years, giving due recognition to the amplitude and profundity which the concept has achieved. As a result, the book was entirely rewritten, starting from a more mature and precise conceptual concern.

Among the major gains in the new version are a broader analytical perspective, a clear incorporation of the problems of scale and, most importantly, a dialogue with risk society theory. This

theory was one of the most notable absences at the interface of social and geographical studies of risk, hazard and vulnerability (Marandola Jr. and Hogan, 2004a,b). Wisner *et al.* (2004), however, question the validity of Beck's approach (Beck, 1992) as being too tied to advanced Western societies, while the focus of the authors concentrates on the less developed countries, where ideas of 'reflexive modernization' or even 'ecological modernization' cannot yet be considered consensual or as well established as in the reality on which Beck focuses.

However, the authors identify points of dialogue with the risk society, especially in the discussion of the roots of vulnerability, considering the political and institutional aspects analysed by Beck (1992), or the discussion of Giddens (1992) on the risk-truth relationship, and its possible consequences for the discussion of citizenship and political mobilisation in mitigating losses related to disasters and in the reduction of vulnerability.

In this effort of conceptual development and in the evaluation of studies undertaken since the first edition of the book, the authors find many other points of dialogue with what had been proposed ten years earlier, in addition to other possibilities which deserve attention. These include the focus on cultural, psychosocial and subjective determinants and impacts arising from natural disasters and from the experience of risk and hazard, as well as the incorporation of the notions of resilience, sensitivity, social capital and collective action in several studies (Wisner *et al.*, 2004: 14).

In Philo's terms, this perspective requires that geographers look at both 'wounder' and 'wounded', i.e. at the production of vulnerability as well as at who is vulnerable and where there is vulnerability (Philo, 2005). On the other hand, as Valentine (2005) argues, it is important to think of shared vulnerabilities. Rather than focusing only on race or gender, for example, researchers should try to 'unpack intersectionality', looking at the multiple discrimination suffered, for example, by deaf lesbians. This is in line with Blaikie *et al.*'s (1994) insistence that natural hazards and risks associated with 'normal' life be analysed within the same framework.

The tendency of the last decade, then, was to go beyond the simple focus on specific, spatially located events, in a case-by-case approach,

leading researchers to more ambitious goals, tending to contemplate higher scales of the geographical and social relations involved in the causal structure of the phenomena and their consequences. Thus, studies came to have a regional (Kasperson *et al.*, 1995a; Hewitt, 1997) and global focus (Liverman, 1994; Kasperson and Kasperson, 2001a,b; Turner II *et al.*, 2003a,b; Cutter, 2003).

The regional focus is crucial in order to understand ecosystems and the environmental changes provoked by human action. Phenomena such as drought, the use of water resources, storms, floods, soil degradation, deforestation, dense urbanisation, conversion of forests into agricultural soils and the construction of reservoirs are among those which have led to environmental changes at the regional level. These changes cannot always be reduced to a simple equation: one causal element for one specific kind of damage. More frequently we find more complex matrices which makes it difficult to establish simple causal relations.

Kasperson *et al.* (1995a), in their important book *Regions at Risk*, argue that regional environmental changes need to be treated differently from studies of global change:

'By "regional dynamics of change", we refer to the relationships that exist among the factors that together shape the changing nature of human-environment relationships and their effects within a particular region. By "trajectories of change", we refer to the trends among these relationships over time. The analysis of regional dynamics requires successive examinations of relationships from different scales and vantage points, and over differing historical periods.' (Kasperson *et al.*, 1995a: 27)

They seek, therefore, to create a counterpoint to micro-scale studies. These 'verticalise' the problematic in certain places, but need regional studies in order to be coherent and to find support and explanation within the larger system in which they are inserted. The region is therefore seen as a middle level explanation, which allows a connection between the local and the global.

The global level, in turn, has also received renewed attention from researchers. While Geography once proclaimed itself to be a

'regional science', today there exists, in the wake of *sustainability science*, a *global environmental change science*, bringing together a growing number of scientists from different disciplines (Kates *et al.*, 2001).

Liverman (1994) called attention to the need for this global vision of environmental change, since, according to her, the metaphor of Space-ship Earth and the realisation that 'we're all in the same boat' only show what science has already told us: no-one can escape the consequences of deforestation, of the attack on the ozone layer or of global warming. Even though these transformations are distributed in a non-uniform way, the author affirmed that to react to changes and compensate for their impact, there is a need to know who is vulnerable to what, so that it will become possible to decide how to respond effectively (Liverman, 1994).

The emergence of a corps of scientists from distinct areas, dedicated to the full discussion of these global problems, has led to the creation of international fora, similar to what is happening with discussions of Kates *et al.*'s (2001) *sustainability science*.

'Research on global environmental change has significantly improved our understanding of the structure and function of the biosphere and the human impress on both. The emergence of "sustainability science" builds toward an understanding of the human-environment condition with the dual objectives of meeting the needs of society while sustaining the life support systems of the planet.' (Turner II *et al.*, 2003a: 8074)

These new sciences arise from the need imposed by global change to avoid the traditional dichotomous vision which separates the social from the natural, because, according to Adger, 'this conceptual opposition between society and nature that we bring to bear on all our dealings with our environment is detrimental to sustainability' (Adger, 2003: 2). The author affirmed that the first principle of sustainability is that there can be no separation between the natural and social worlds: they are the same world.

Adger called our attention to the need to incorporate vulnerability and resilience in the discussion of global environmental change. According to him, economic globalisation con-

tributed, in many cases, to increasing the vulnerability of people, especially in an economic and social sense. It is the fruit of liberalisation of trade and a new stage in 'colonialism'. The solution, according to Adger (2003: 3), involves the management of vulnerability on different scales: 'There are two solutions: promote autonomy, local reliance, diversity and risk aversion to diminish vulnerability; or promote integration, specialization, and risk-taking to encourage economic progress and diminish vulnerability.'

Sustainability, vulnerability, resilience and global environmental change are profoundly interlinked in the struggle for justice, environmental or social, and are directly related to equity, autonomy, freedom and access to entitlements, resources and security (Adger, 2003).

But this nexus also involves the consideration and articulation of scales. Neither environmental nor social phenomena can be fully understood at only one of these scales (the global generalises, while the local particularises). In view of this, whether in the discussion of governance, of social and environmental justice or of sustainability, to consider the society–nature dimension requires a trans- and multi-scalar perspective, which captures the different vulnerabilities at each scale in space and time. Turner II *et al.* (2003a: 8076) developed this point:

'The strong variation in vulnerability by location, even to hazards created by global-scale processes and phenomena, however, elevates the role of "place-based" analysis. The term "place-based" implies a spatially continuous distinctive "ensemble" of human and biophysical conditions or coupled human–environment systems. The growing role of multiple stakeholders in defining vulnerability problems, typical with local or localized concerns, lends increasing attention to this level of analysis while simultaneously linking to other places and scales of analysis.'

Ideally an understanding of vulnerability would emerge from considering the totality of a human–environment system. Turner II *et al.* obviously recognized that this is an unrealistic goal. Nevertheless, it is relative to this goal, and always conscious of the limitations imposed by the methods at our disposal, that researchers must recognise the breadth of the system they

are studying and seek to articulate its manifestations in terms of the global, the regional and the local (place). To adopt this posture – regarding vulnerability as a multi-scalar process – is fundamental if researchers are to engage effectively with the cascading nature of vulnerability and to perceive the way in which certain filters may amplify or attenuate certain events, risks and hazards (Kasperson and Kasperson, 2001a).

Both Turner II *et al.* (2003a) and Kasperson and Kasperson (2001a) present schemes which articulate the three spatial scales (place, region, world) to the society–nature dimension (social and biophysical). These analytical schemes seek not only to establish a causal nexus, but also to include the interdependency of scales and phenomena. In other words, in processes involving degradation, vulnerability, resilience and sustainability, there is not a single temporal or spatial direction to events. The diversity of the elements and actors involved in the study of vulnerability therefore means that thinking about both the causes and consequences is very complex.

Studies of global environmental change have much to contribute to the analysis of vulnerability, given both the emphasis on persons and places made vulnerable because of poverty, and an awareness of the link between degraded and fragile environments and the health and quality of life of the population of these areas. Liverman (1994) stated that these focuses are superimposed, helping to design the map of vulnerability in geographical space (where are the vulnerable persons and places?) and in social space (who are the vulnerable persons and places?). The incorporation of different elements in the causal structure of vulnerability, ranging from different scales (local, regional, global) to different dimensions of the phenomena (social, political, economic, technological, demographic, cultural), contributes to a more complex and global vision of vulnerability.

The point that this analysis underscores is the confluence of these ideas within the research community, helping to establish a more robust conceptual basis for vulnerability studies. It is from this perspective that some scientists have come to speak of a 'vulnerability science', to which we now turn briefly below in an attempt to suggest fruitful avenues for future work.

## RECOGNISING UNCERTAINTY: THE ROAD TO 'VULNERABILITY SCIENCE?'

In the same way as 'sustainability science' and 'global environmental change science' emerged to fill gaps within the academy, so also 'vulnerability science' has appeared at the interface between pre-existing disciplines in an academic space previously unoccupied by any single science. It has the potential to address important unanswered questions, drawing on a specific theoretical-methodological corpus of knowledge and using new and challenging perspectives.

However, there are many difficulties. These include not only the problems faced by all new ventures in arguing for the validity of a 'new science', but also the difficulties in constructing an agreed research framework. As is now clear, the search for more conjunctive, integrated and complex approaches demands not only a readiness for dialogue, but above all common methodologies, techniques and theoretical frameworks which sometimes might seem irreconcilable.

In the case of vulnerability, the very use of the concept already presents considerable difficulty. Problems include communication among the communities involved, the different contexts of debates on risk, the distinct areas and scales of analysis, agreement on theoretical-methodological frameworks and on the perspective of study (internal or external to the phenomenon) (Watts and Bohle, 1993; Kasperson and Kasperson, 2001a), and qualitative vs quantitative approaches (Neff, 2005). All point to a situation so complex that it is difficult to recognise a wide-ranging framework for this research.

The epistemological and ontological questions raised by this search for convergence reveal complex themes embedded at the very heart of the history of Western philosophy and science. We may not always be fully prepared to confront the fundamental problems relating to the theory of knowledge and what is 'knowable'. Questions may be posed, for example, in terms of the opposition of monism (the one) and pluralism (the multiple). The first is part of traditional, modern science and constitutes, in the terms used by Santos (1995), the dominant paradigm: scientificist, from the neo-positivist inheritance, using as criteria of truth 'facticity' based on mathematical demonstration and subject to global, universalising, scientific rationality (Santos, 1995). On the

other hand, the multiple is linked to Aristotle and to other philosophers throughout history (Nascimento, 1995), but also to a post-modern perspective on the conception of a new scientific and philosophical paradigm, where plurality, alterity and tolerance represent the values of legitimation and truth (Santos, 1995; Favaretto, 1995). In this case, the assumption is that there is knowledge of diverse types. This in turn implies different methods of producing knowledge and, consequently, different criteria of legitimation and validation of its status (Hessen, 2003). Even if we do not assume a radical 'everything goes' position,<sup>6</sup> what is important from this perspective, which flourished in different contexts throughout the twentieth century, is the reinsertion in the ontological status of knowledge of a recognition of the *other*, requiring the need to recognise not only the complexity of the nature of knowledge (Morin, 1977–80), but also the uncertainty and imperfect nature of scientific knowledge in understanding such complexity (Prigogine, 1997; Beck, 1992) and the role of the subject in the acquisition and production of knowledge (Merleau-Ponty, 1945; Casey, 1997; Husserl, 2001).

While facing up to the historical confrontation between the one and the multiple is not easy, for all the reasons listed above, on the other hand it presents the researcher with the challenge of understanding unity in diversity, seeking an interdisciplinary dialogue without losing the identity of each discipline, and at the same time seeking to establish a dialogue that is effective in relating very different areas of knowledge in a way that affirms that the outcome is much more than the simple sum of the knowledges of different natures and origins.

For many, however, this is impossible to achieve without revising hegemonic scientific rationality itself (Leff, 2000a, 2001). As has been argued in this essay, research which draws upon different ontological, moral and epistemological assumptions (such as is the case in vulnerability studies undertaken both by social and environmental scientists) often has assumptions which are so irreconcilable that it is difficult to conduct interdisciplinary work that does not just produce a list of fragmentary contributions which appear in the end to be like the pieces of an enormous jigsaw puzzle. This may be ordered, logical and coherent; however, it is still a jigsaw puzzle with



many missing pieces which may not produce a vision of the totality of the phenomenon under study, but instead a rather fragmented picture reflecting the difficulty of integrating work undertaken around disparate foci and from diverse perspectives.

This situation is reflected in the vulnerability of science itself, as Cutter (2003) has written. In her opinion, since all the world's population lives in a situation of poverty and risk as never experienced before, science also can but be affected. Indeed, science is being increasingly questioned today, together with concepts such as modernity, because of their incapacity to bring certainty and to offer definitive answers to resolve the pressing problems of society (Beck, 1992; Touraine, 1995; Santos, 1995).

Society expects that science will help to reduce uncertainty, which places science in an incredible ambiguity, since uncertainty is part of reality, especially in questions such as global environmental change and vulnerability. 'Imbedded throughout the discussion on the science of vulnerability is the requirement to anticipate surprise, capture uncertainty, and accept change in our science and understanding' (Cutter, 2003: 6). It is the very basis of science which leaves it vulnerable: rationality, laws, judgments and uncertainty.

So where do we turn? Is it a vain effort to try to conduct integrated research and to seek an interdisciplinary conceptualisation (wide-ranging and conjunctive) of vulnerability? We refuse to accept this goal as unattainable, to the extent that considerable advances have been made, in various areas of knowledge, in an effort to establish fruitful dialogue on ontological and methodological issues. For the authors of this paper, the studies of Leff on environmental rationality, based on a dialogue between different ways of knowing (which includes both scientific disciplines and common sense, cultural knowledge, religion and art), have inspired not only our personal attention, but also resulted in many useful empirical studies in Latin America (Leff, 2000a,b).

In the institutional sphere (academic and political-administrative) there have been significant signs of change, with the strengthening of fields of research and teaching of an interdisciplinary nature, not only those tied to environmental sciences (and the 'new sciences' derived from this field), but in other fields of knowledge as well.

Research centres, journals, graduate and undergraduate courses, and programmes of international multilateral agencies have encouraged and promoted the development of these new interfaces (Philippi Jr. *et al.*, 2000; Kasperson and Kasperson, 2001a; Kates *et al.*, 2001).

In this sense, Cutter defended the idea that the 'science of vulnerability' has contributed to a better understanding of vulnerability in the world, and argues that researchers need to continue to invest in it.

'As it evolves into a more robust field, however, vulnerability science is in a position to help reduce some of the inherent vulnerability of science and scientific explanation. But it will require transdisciplinary linkages, methodological pluralism, place-based knowledge, and a continued practical focus on policy relevancy.' (Cutter, 2003: 8)

Because 'vulnerability science' is reflexive (Beck, 1992), Cutter affirmed that it learns from experience and anticipation, looking for future changes in vulnerability. It uses a pragmatic vision, but seeks to connect it to a wider theoretical field and to an arena of political action committed to social and environmental justice. In addition to this, as we have pointed out, it promotes the need for a confluence of knowledge in the natural and social sciences. This is indispensable for their diagnoses and predictions. Thus, 'vulnerability science is one path that leads to understanding what makes people, places, and societies vulnerable to a range of environmental threats' (Cutter, 2003: 9).

This interaction incorporates both the discussions on social and sociodemographic vulnerability and the dimension of the *vulnerabilisation* of citizenship. However, the focus outlined here seeks to be wider. The researchers dedicated to these themes, as we have seen, have not always incorporated the environmental problematic in their notions of vulnerability, understanding it above all in a social sense. On the other hand, those involved in vulnerability science, or even with environmental vulnerability (except for some studies of natural vulnerability), have very much included social dimension such as poverty and exclusion in their theoretical and empirical work.

Furthermore, the study of vulnerability science should prioritise a spatial approach. The geo-

graphical dimension of these phenomena is fundamental, to the extent that it permits a better understanding of scale and of regional and local interactions. Concepts like place and region, treated from a geographical perspective, contribute decisively to the search for understanding the 'totality of the system'. And in this specific case, geography as a discipline has an important role to play, given that it has in its traditional scope, both modern and contemporary, dealt within its disciplinary project with ideas involving very different knowledges, ontologies and epistemologies. The unity of geography exists precisely at the society–nature interface. It may therefore contribute to widening the dialogue amongst the sciences in general about the construction of new paradigms and ontological and epistemological methods for operationalising vulnerability science.

It is necessary, however, to seek theoretical-methodological paths which permit the incorporation of trans-scalar and multidimensional perspectives in vulnerability science. Integrating the efforts of different sciences and fields of knowledge to shape an integrated field of study will not be easy, however. Environmental studies in general, and vulnerability research in particular, require broad perspectives because they involve problems which demonstrate in a particularly convincing way the impossibility of treating the social and physical dimensions of phenomena separately. In addition they exemplify the significance of scalar dynamics in the processes of production, distribution and management of risks, hazards and vulnerabilities.

Several philosophical frameworks and empirical studies have contributed to these approaches, favouring a move in the direction of quanti-quali and transdisciplinary perspectives. Studies on complexity, as well as those tied to the phenomenology and metaphysics of nature, have raised relevant questions relative to established theories of knowledge, to promote the revision of concepts and of the meaning of academic practice and indeed the very nature of knowledge. A possible vulnerability science arises in this context, seeking to organise elements which corroborate and promote a transversal and multidimensional view of human beings and their environmental situation. The concepts of Sen (1981, 1999), especially on entitlements, functionings, freedom and

the expansion of capacity, have a decisive contribution to make to this science. Researchers should continue to seek to incorporate and rework these concepts in the different contexts and arenas of vulnerability analysis.

One question which must be confronted by scientists is the scope of measures designed to protect people from hazards or to diminish their vulnerability at an individual level (systems of insurance and welfare, entitlements emanating from the private sector). There is a need to understand better the systems of production and distribution of entitlements (including environmental entitlements), in order to understand this dynamic and its real scope and consequences. Bauman (1997) questioned whether these systems of protection have sufficient meaning or whether they can be extended to include collective survival:

'The abyss of the species in which we find ourselves – all of us together, and the majority of us individually – is so terrorizing because of its tendency to fragment the question of common survival in a handful of individual questions of survival, then eliminating the question thus pulverized from the political agenda.' (Bauman, 1997: 282) [our translation from the Portuguese]

This pulverisation of the political agenda is one of the clearer pieces of evidence of the individualism of questions of survival and of the struggle for rights. The question of citizenship has become a personal – not a class or collective – issue. Environmental problems appear to have rescued or channelled activism for social (environmental) justice, and have become one of the fields of greatest convergence and struggle on all levels. It has also been a forum for the meeting of scientific knowledge, justifying 'new' fields such as vulnerability science.

To overcome these difficulties in an effective scientific and social way, ensuring that these desires become assets and opportunities, or entitlements and empowerments, is the daily challenge that researchers seek to answer. The theoretical-conceptual reflection begun here seeks to guide our theoretical-empirical work in progress, in an effort to practise and to reflect on the possibilities of these dialogues. To contemplate these approaches and concepts should enrich thinking on the topic and nourish our

search for the best ways forward in vulnerability studies.

We are not yet on firm ground in the epistemological or even ontological fields, so as to be able to point in the direction of implementing these dialogues. This is part of what has motivated many of the recent developments in vulnerability science. To reconcile differences and join forces rather than dividing and weakening our position is a worthy objective: this is an ambitious but key goal in the study of vulnerability and in the search for paths for an interdisciplinary and robust conceptualisation of this indelible mark of contemporary society.

## NOTES

- (1) For a more detailed analysis of the possibilities and limitations of the notion of assets, social advantages and disadvantages, see Kaztman (1999) and Kaztman *et al.* (1999).
- (2) Another example is the notion of human capital, whose inspiration is credited to the focus on the capacities and functionings of Sen (Sen, 1998; Crocker, 1992).
- (3) There were, for example, 35,000 Swedes in Thailand on 26 December 2005, especially concentrated in Phuket. Deaths and injuries made the tsunami equal to the most severe natural disasters ever suffered by the Swedish population (Malmberg, 2005).
- (4) For an evaluation of this line of research, see White (1973, 1974), Cutter (1994, 1996) and Marandola Jr. and Hogan (2004a).
- (5) Mattedi and Butzke (2001) analysed the state of the art of these two perspectives, identifying their similarities and differences in the approach to social and natural dimensions and in the study of floods.
- (6) A position over-hastily attributed to the important epistemological works of Feyerabend (1983) who, on the contrary, defended greater freedom and flexibility in the use and application of scientific methods, in an attempt to break with dogmatic positions.

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