Understanding Vulnerability to Understand Disasters

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Note:
Although this document is focused for a disaster audience, a wide view of the definition of "disaster" is and should be adopted, as noted in the text, in order to incorporate many forms of environmental and social change, including climate change (human-caused or otherwise). This approach matches the attitudes of the authors referenced here, thereby applying an expansive view so that disaster risk reduction is part of human-environment interactions and so that disaster-related ideas are implemented within development and sustainability processes and contexts.

1. Vulnerabilities, not Hazards, Cause Disasters

In tackling disasters, the focus is frequently on an environmental event, such as a tornado or earthquake, which is often termed the "hazard". These environmental events, however, are normal and they serve important ecological and societal functions. Examples are a flood fertilizing land and providing water resources plus a windstorm knocking down old trees to provide habitats on the forest floor along with space for new trees to grow. Such events are termed "hazards" from a human perspective when humans cannot cope with them.

They can become disasters, often defined as a situation where a community's ability to cope with an event is surpassed, whether that event is environmental or non-environmental and whether that event is or is not extreme. Hewitt (1997) refers to "unnatural hazards" suggesting that "natural hazards" are not "natural" because they are generally hazardous to only humans—along with human action frequently changing environmental processes to make them more hazardous. An example is engineering a river for navigation and settlement which exacerbates floods (Criss and Shock, 2001; Etkin, 1999).

One consequence is that disasters are not confined to situations involving rapid-onset, relatively clearly-defined events, such as earthquakes and tornadoes. Disasters resulting from events which are more diffuse in space and time are also incorporated, such as droughts and epidemics. Conditions which become disastrous but with less clear start and end points are disasters too; for example, glaciation, desertification, sea-level rise, and changes to the climate.

Different approaches exist for differentiating amongst events with different onset times and with different clarities of start and end points. Glantz (1994) uses the terms "creeping environmental changes" and "creeping environmental problems" to describe ongoing changes which overwhelm a community's ability to cope, such as desertification, salinization of water supplies, and sea-level rise. The potential for damage or harm to occur beyond a community's ability to cope also occurs through low-quality water supply, energy overuse with dependence on non-renewable supplies, and inadequate waste management—which could be termed "creeping social changes" and "creeping social phenomena".

Sometimes, population numbers, population densities (including urbanization), and population inequalities (determined through livelihoods, poverty, or entitlements) are highlighted as being the creeping disasters faced. The longer-term processes could also be termed "disaster conditions", or "disastrous conditions", in contrast to "disaster events".

Expanding the definition of "disaster" leads to more political interpretations seated in root causes. Disaster conditions could be interpreted as including a lack of resources available for tackling outside interests which are exploiting local human and material resources or as gender, ethnic, or caste discrimination. Lack of choice, entitlement, or empowerment could be debated as the fundamental disaster conditions, leading to, for example, population growth and population density growth that exacerbate disasters—rather than population numbers being the disaster itself. Incompetence, ignorance, or corruption in failing to implement disaster risk reduction could be considered to be the disaster, rather than the tornado or flood event which kills.

How does that inability or disinterest in dealing with normal environmental events arise? Policies and decisions over the long-term have created conditions which often neglect communities' perceptions of their own context; which fail to account for building and maintaining abilities to deal with normal events, however extreme; and which in some cases exacerbate an environmental event, such as structural flood defences increasing the depth and velocity of river flows. These conditions include poverty, lack of choice, lack of entitlement, poor governance, selfishness, and apathy, amongst many other factors.

Key literature (see Appendix 3, especially Hewitt (1983), Lewis (1999), Oliver-Smith (1986), and Wisner et al. (2004)) agrees that the processes by which these conditions are created involves "vulnerability" and that vulnerability leads to disasters much more than normal environmental events. This "vulnerability process", rather than being a quantitative snapshot in space and time, is not only about the present state, but is also related to what we have done to ourselves and to others over the long-term; why and how we have done that in order to reach the present state; and how we might change the present state to improve in the future.

2. Vulnerability Analysis

In understanding and analyzing vulnerability, much research and practice neglects the more comprehensive view, instead developing methods which assume that vulnerability is:

- Quantitative: vulnerabilities can be calculated and summed.
- Objective: vulnerability analysis is factual and indisputable.
- Absolute: only the exact numbers, such as the size and density of the population affected, are used to understand vulnerability.
- Non-contextual: calculation methods are transferable to other locations.
- Useful for understanding the current state only because this snapshot provides the full story.

To fully tackle the vulnerability challenges faced over the long-term, it is important to include in analysis methods that vulnerability is also:

- Qualitative: emotions and intangibles (e.g. photographs and archeological sites) are important.

- Subjective: characteristics termed "vulnerable" depend on the point of view adopted. For instance, Russia has been saved at least three times from invading armies by the winter being a significant factor in their enemy's defeat. Storms were a key factor in at least two English naval victories. In these cases, one side saw weather damage as vulnerability while the other side saw the weather damage as being helpful. The label depends on to whom the damage was being done and the point of view adopted.
- Proportional: percentages of people or infrastructure affected matter in addition to absolute numbers. For example, islands often have small populations relative to megacities, so even if 100% of an island's population is affected by an event, it is unlikely to match the numbers which could be affected during a similar event in a megacity. Yet 100% of a small population affected can be much worse than 1% of a large population affected. Absolute and proportional metrics provide different characteristics of vulnerability. As well, here they are presented as being quantitative. Is there meaning in comparing "qualitative absolute" with "qualitative proportional"?
- Contextual: vulnerability depends on each specific situation. Some languages do not have a word for "vulnerability" and the concept is difficult to explain within that cultural context. Two examples are Nepali and Inuktitut (based on personal communication from colleagues who speak those languages and who have conducted disaster research in locations where these languages are spoken). Perhaps "vulnerability" and related terms are predominantly modern Western constructs so that useful ideas could be applied from cultures where "vulnerability" has less meaning.
- A process with a past and future, which is not dictated by or interpretable through a single event or a specific disaster type.

Incorporating these theoretical ideas into practice is an ongoing challenge, but a solid basis exists from which to start. GIS can represent proportions as easily as absolutes. PGIS (Participatory GIS) and P3DM (Participatory 3-Dimensional Modelling), while far from panaceas, can incorporate elements of qualitativeness and contextuality. Maps can be drawn to represent people's perceptions or to emphasize relative results, rather than always being accurate with regards to distances (e.g. http://www.worldmapper.org). Textbooks exist on qualitative data collection and analysis to support this work. Skills in history and anthropology can link the past, present, and future. Participatory methods (e.g. Chambers, 2002) can ensure that subjectivity, qualitativeness, and contextuality are properly considered. Different styles and sizes for interviews and surveys can provide data for cross-checking to see how contextual any quantitative results might be, rather than relying on a single method.

The main lessons are (i) do not permit the tool to dictate the analysis method or the understanding of the situation; and (ii) do not rely on numbers to provide the complete story, especially since all vulnerability-related numbers have some level of subjectivity to them.

3. Putting the Theory Into Practice

These theoretical ideas and principles have been implemented in practice. Oliver-Smith (1979) referred to a 400-year earthquake in examining the 31 May 1970 earthquake and rock avalanche in Yungay, Peru which killed most of the city's inhabitants. That 400 years is not the geological return period of the seismic or avalanche event, but instead refers to the fact that the root causes of the vulnerability, which were exposed during the event, took 400 years to build up, because the vulnerability that caused the disaster can be traced back to the Spanish conquest of the region, in terms of demographics, settlement locations, and ways of living.

With that rationale, were the 26 December 2004 Indian Ocean tsunamis, that killed over 250,000 people across more than a dozen countries, 100- or 200-year events or more? Or has coastal vulnerability built up much faster than that and they were 20- or 40-year events, even though the earthquake and tsunamis had century-scale geological return periods?

As another example, Etkin (1999) describes how reliance on structural flood defenses increases vulnerability over the long-term in a process termed "risk transference". Structural defenses stop smaller floods and permit people to live in floodplains while remaining relatively dry. As a result of this false sense of security, vulnerability to floods increases (see also Appendix 1). Most structural defenses must fail at some point, often by an event which exceeds or has different characteristics from the design flood. Then, the damage incurred by the flood is much greater than it would have been without the false sense of security imposed by the structural defenses. Short-term flood risk has decreased, but long-term flood risk has increased. Risk is transferred into the future and augmented, hence the term "risk transference".

This discussion leads to the tenet, extensively published and supported with evidence (see Appendix 1), that no disasters are natural; the term "natural disaster" is a misnomer. The event from nature, whether it be a thunderstorm or wildfire or landslide, is perfectly normal—and in many cases has significant advantages. Human decisions over the long-term build up vulnerability and that vulnerability is exposed by the event to yield the disaster. This notion can be extended further, as per the discussion in the opening paragraph (see also Appendix 1), to explain that no hazards are natural; the term "natural hazard" is a misnomer. "Hazard" is a judgment foisted onto a normal—and often ecologically essential—environmental process because humans have made long-term choices which make the event hazardous to them. Extracting such principles from absolute and quantitative metrics is difficult, suggesting the need to think beyond numbers—and beyond analyzing only what is observed in the present.

The discussion regarding the "naturalness" of hazards and disasters, however, acknowledges that viewpoints tend to depend on the definition adopted. Definitional arguments are not just academic exercises—they are needed for insurance, liability, and constitutional processes amongst others—but they can also sometimes obscure deeper meanings. As well, events to which it is challenging to reduce vulnerability include basaltic flood volcanic eruptions, large meteorite strikes, and gamma ray bursts from nearby stars—although the counterargument is that we have not tried to reduce such vulnerability.

For understanding vulnerability, the important ethos is to accept human responsibility for the observed disaster ills and to accept human ability to reduce these ills. In research and for practice, the vulnerability literature suggests this ethos as the starting point for understanding—and then reducing the risks and impacts of—disasters.

4. References

See Appendix 3 for references given in the text, but not listed here.

Chambers, R. 2002. Participatory Workshops: A Sourcebook of 21 Sets of Ideas and Activities. Institute of Development Studies, University of Sussex, Brighton, UK.

Criss, R.E. and E.L. Shock. 2001. "Flood Enhancement Through Flood Control". Geology, vol. 29, no. 10, pp. 875-878.

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Oliver-Smith, T. 1979. "Post Disaster Consensus and Conflict in a Traditional Society: The 1970 Avalanche of Yungay, Peru". Mass Emergencies, vol. 4, pp. 39-52.

Appendix 1: Further Discussion

1. "Disaster Lexicon" at http://www.ilankelman.org/miscellany/DisasterLexicon.rtf

2. "Natural Disasters Do Not Exist (Natural Hazards Do Not Exist Either)" at http://www.ilankelman.org/miscellany/NaturalDisasters.rtf

3. "Reliance on Structural Approaches Increases Disaster Risk" at http://www.ilankelman.org/miscellany/StructuralDefences.rtf

4. "Overcoming Disaster Through P^3: Principles, Policies, Practices" at http://www.ilankelman.org/fpp.pdf

Appendix 2: Examples Illustrating the Variety of Vulnerability/Resilience Definitions

See also other glossaries with entries for "vulnerability" and "resilience" at:
•http://www.ehs.unu.edu/moodle/mod/glossary/view.php?id=1&mode=letter&hook=SPECIAL
•http://www.ehs.unu.edu/file.php?id=118
•http://cost731.bafg.de/servlet/is/9700/documentation/WDF_02_200604_1.pdf
•http://www.epa.gov/reva/glossary.htm
•http://www.csc.noaa.gov/vata/glossary.html

●Coastal Management
Klein, R.J.T. and R.J. Nicholls. 1999. "Assessment of Coastal Vulnerability to Climate Change". Ambio, vol. 28, no. 2, March 1999, pp. 182-187. Paraphrased from page 184:
Vulnerability is a function of:
- resistance, the ability to withstand change due to a hazard;
- resilience, the ability to return to the original state following a hazard event;
- and susceptibility, the current physical state, without taking into account temporal changes.

●Ecosystem dynamics
Townsend, C.R., M. Begon, and J.L. Harper. 2003. Essentials of Ecology, Blackwell Publishing, Oxford, England. http://www.blackwellpublishing.com/Townsend/Glossary/GlossaryR.asp
Resilience
The speed with which a community returns to its former state after it has been disturbed.

●IPCC (Intergovernmental Panel on Climate Change) http://www.ipcc.ch/pub/syrgloss.pdf
Resilience
Amount of change a system can undergo without changing state.
Vulnerability
The degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is exposed, its sensitivity, and its adaptive capacity.

●SOPAC (Pacific Islands Applied Geoscience Commission)
http://www.sidsnet.org/docshare/other/20030910171306_Vulnerability_for_dummies.pdf
Vulnerability
The tendency for an entity to be damaged.
Resilience

The opposite of vulnerability and refers to the ability of an entity to resist or recover from damage.

Vulnerability and resilience are two sides of the same coin. Something is vulnerable to the extent that it is not resilient.

●UNISDR (United Nations International Strategy for Disaster Reduction)
http://www.unisdr.org/eng/library/lib-terminology-eng%20home.htm

Resilience / resilient

The capacity of a system, community or society potentially exposed to hazards to adapt, by resisting or changing in order to reach and maintain an acceptable level of functioning and structure. This is determined by the degree to which the social system is capable of organizing itself to increase its capacity for learning from past disasters for better future protection and to improve risk reduction measures.

Vulnerability

The conditions determined by physical, social, economic, and environmental factors or processes, which increase the susceptibility of a community to the impact of hazards.

Appendix 3: Key References on Vulnerability/Resilience

Acosta, V.G. 2005. "El riesgo como construcción social y la construcción social de riesgos". Desacatos. Revista de Antropología Social, septiembre-diciembre, vol. 19, pp. 11-24.

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